NEW ZEALAND JOURNAL OF

Agriculture

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[*N.Z. Forest Service photo by J. H. Johns*

Stones collected from paddocks on the farm were used for building the striking Hororata homestead of Mr T. H. Stone shown on our cover. The owner is a farm forestry enthusiast as is evident from the fine plantation of native and exotic trees against which his home is set. In the porch at right are inset specimens of stone from many parts of the world including Gallipoli (where Mr Stone served during the First World War) and Antarctica.

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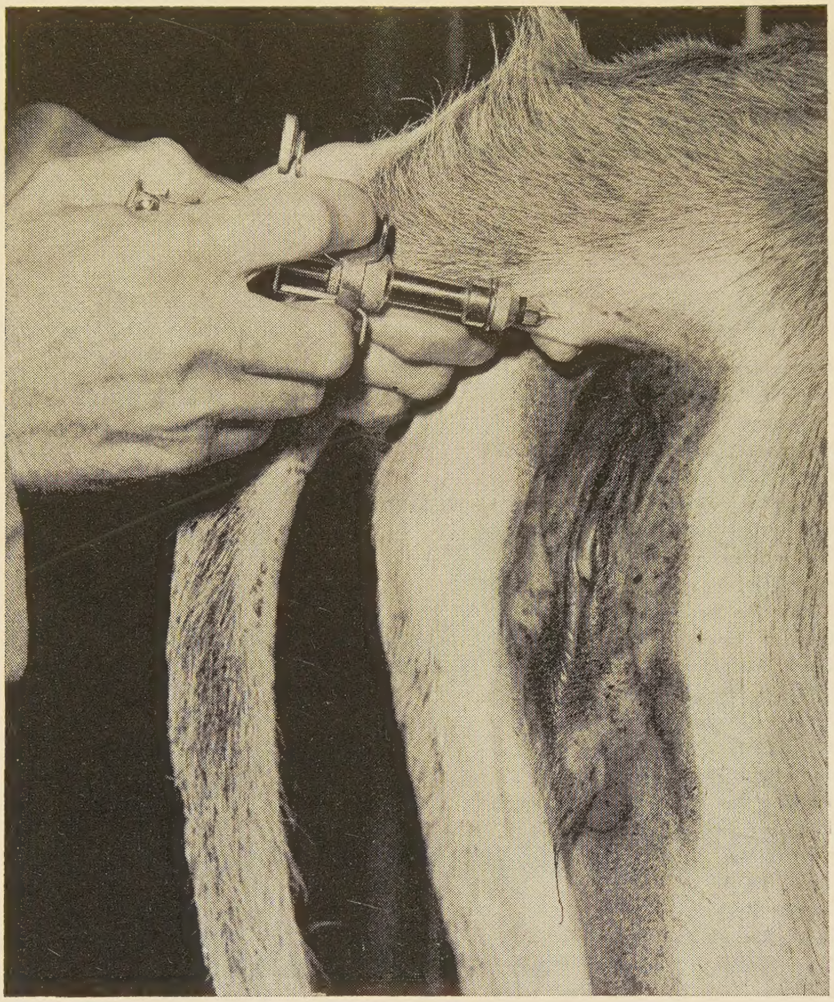


Bovine Tuberculosis

Problems and Prospects of Eradication

By S. JAMIESON,
Chief Advisory Officer
(Infectious Diseases Control),
Department of Agriculture,
Wanganui

▲ Method of carrying out the tuberculin test.

← Four bovine tubercle bacilli (in circle) surrounded by tissue cells. These bacilli cause the inflamed lumps (tubercles) shown in the illustration on the opposite page.

OF all the diseases which affect man and domestic animals tuberculosis is probably the most insidious in its spread. The human variety may be transmitted to animals, and the germ causing the disease in cattle does not confine its attention to bovine animals, but, given the opportunity, will spread to pigs, horses, and human beings. In other countries, before eradication schemes were adopted, the health and economy of many agricultural communities were seriously affected by this disease. This is common knowledge, and the willingness of the farmer to eradicate tuberculosis from dairy herds in New Zealand is not in question; but there is much misunderstanding among farmers concerning methods of testing for tuberculosis and consequently much questioning and criticism, and this article has been compiled to explain methods used and answer some questions commonly asked.

THE cause of bovine tuberculosis is a very small germ, called a "bacillus" because of its cylindrical, rod-like shape, and named "tubercle" because it raises inflamed lumps or tubercles in the tissues of the animals it invades. As the germs multiply the tubercles enlarge and the affected tissues are converted into dead, yellowish white, cheesy material. These inflamed lumps and the resulting dead material are the "lesions" of tuberculosis seen on post-mortem examination. Occasionally the lesions are walled off by the defences of the infected animal's body and the progress of the disease is arrested; more often infection spreads and the germs continue to multiply until the animal's production and finally its life are destroyed.

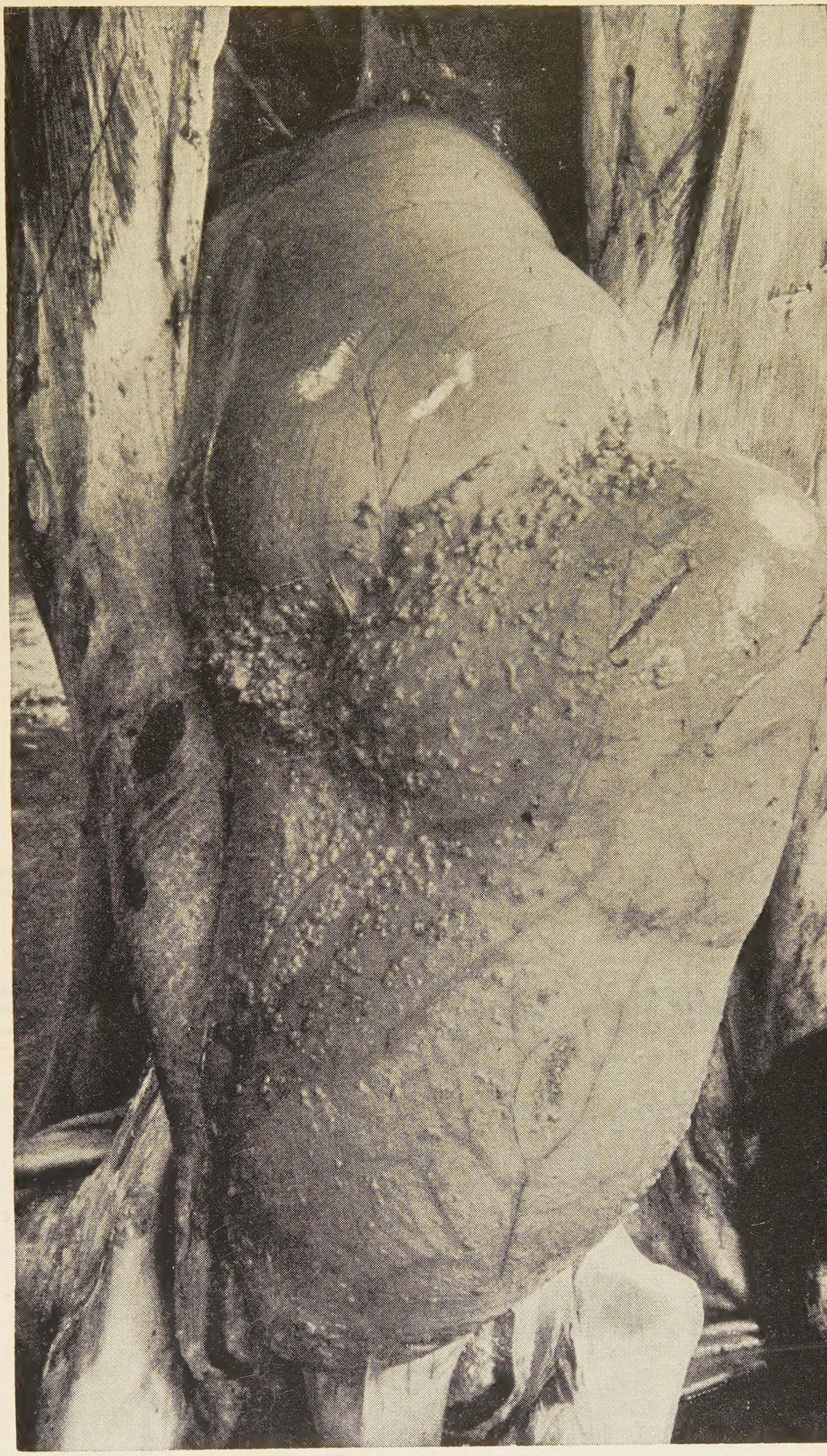
So much for the progress of the disease. But whether or not the lesions are visible, whether there are few or many tubercle bacilli present in the animal's body, **if they are present at all,** their living processes will within a very short time bring about an effect on their host's tissues, an effect which is used as the basis of the standard "tuberculin" testing used in tuberculosis eradication schemes.

Tuberculin Test

Whenever an animal is host for longer than a few weeks to tubercle bacilli their presence sensitises its tissues, so that injection of a test fluid named tuberculin causes a "reaction"; in other words, an inflamed swelling results at the spot where the injection has taken place. If there is no reaction, the farmer may be certain that the animal harbours no tubercle bacilli.

The tuberculin used in this test is itself a by-product of the tubercle bacillus. To obtain it bacilli are grown in the laboratory in a nutrient fluid (one containing suitable germ food); after some time the living germs are killed and filtered off from the liquid in which they have lived; this liquid is then sterilised and is ready for use in the tuberculin test. The liquid contains neither living nor dead germs but only chemical products made by the tubercle germs when alive.

Injection, then, of a small amount of tuberculin into the skin layers of an infected animal indicates accurately the presence of the bacilli by a swelling at the injection site. This is a "positive reaction", and the animal so responding to injection is classed as a "reactor".



Numerous inflamed lumps or tubercles on the surface tissues surrounding the stomachs of a reacting cow. As the germs multiply these tubercles enlarge and the affected tissue is converted into dead material.

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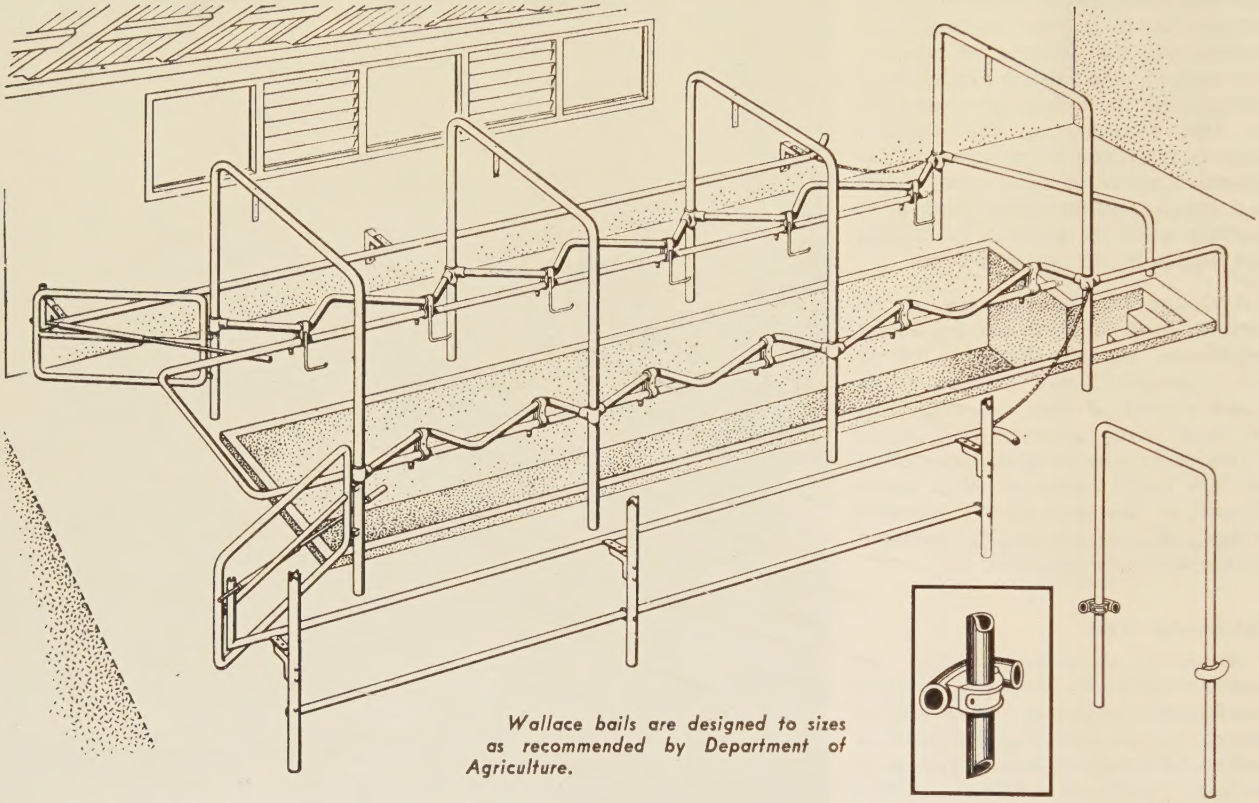

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Problems of Test

Though a positive reaction to injection of tuberculin is **always** obtained when an animal has had bacilli for longer than a few weeks, the test does not show to what extent tuberculosis has progressed. With few or many bacilli the reaction is the same; therefore, a slaughtered reactor may show lesions plainly indicating that it is suffering from tuberculosis, or it may not have harboured the germs long enough to develop lesions.

At first the lesions are of mere pinhead size which may very easily be overlooked in examination of the tissues. Further if the tubercle bacilli have been present for only a short time, there will be very few lesions and none may be located in the particular tissues examined. The tuberculin test, picking out the "reactors", is thus a much more certain means of detecting the presence of the germs than is any search, however careful, conducted by sight.

It must be emphasised, however, that it is only the presence in the animal's body of the tubercle bacillus which is definitely shown by a positive reaction to the tuberculin test and not the disease itself.

This is the farmer's first difficulty in accepting tuberculin testing. If some slaughtered animals show no visible lesions, the farmer is inclined to think that the test cannot have been accurate and to forget that in an animal harbouring the tubercle bacillus the disease may not yet be obvious; today's reactors with no visible lesions may well have visible lesions within a very short time.

Other Sensitising Germs

The second difficulty in tuberculin testing is that the tissues of bovine animals may occasionally be sensitised to tuberculin by the presence in the animals of one or other of several types of germ closely related to the tubercle bacillus but not causing the disease bovine tuberculosis. Such is the germ causing so-called skin tuberculosis; others are the germs causing Johne's disease, the human tubercle bacillus, and the bacillus causing tuberculosis in birds. Presence in bovines of germs of the two last-named types is rare in New Zealand, but the germs causing skin tuberculosis and Johne's disease are of fairly wide occurrence. Since presence of any of these germs may sensitise an animal's tissues to tuberculin, the animal may react positively, but if slaughtered will not show any lesions of tuberculosis. This second group of reactors are called "non-specific" reactors. It is natural for a farmer to resent that some of his animals which may not have tuberculosis should be set aside for slaughter, but if the disease is to be eradicated, it is important that **all** tuberculous animals shall be picked out of the herd, and tuberculin testing **does** achieve this. The infrequent sacrifice of a non-tuberculous animal is of small account relatively to the main objective.

Success Overseas

It is necessary therefore to emphasise that tuberculin testing is not a simple device to sort out automatically from a herd all animals suffering from tuberculosis, and to sort out these alone. It is a test which, conducted by experienced personnel and considered in relation to other pertinent facts in the herd history, has proved adequate to ensure tuberculosis eradication in the United States, Norway, Sweden, Denmark, Scotland, and Holland; and since the difficulties encountered in New Zealand are precisely those already met in the countries mentioned, it is certain that tuberculin testing is a satisfactory basis for eradication here in New Zealand, too.

It may be profitable now to consider exactly how tuberculin testing is carried out, and how herd history and other details affect interpretation of the results.

Whole Herd Must be Tested

First, to give maximum benefit tuberculin testing must be carried out on the whole herd, as there is obviously no point in having any untested animals to confuse the results and to form a possible source of reinfection of clean animals. It is also necessary to repeat the testing until the herd is declared healthy. The reason for this is not hard to find. When tubercle infection is introduced into a herd by a tuberculous animal not all animals will become tuberculous at once. It will therefore be necessary to test at intervals to ensure that all animals contracting the disease are detected. Further, in a herd in which tuberculosis has existed for some time all stages of the disease will be found, and more animals may later pick up the infection which the already infected beasts have spread. Repetitive tests are the only means of detecting all infected animals.

Spread of Infection

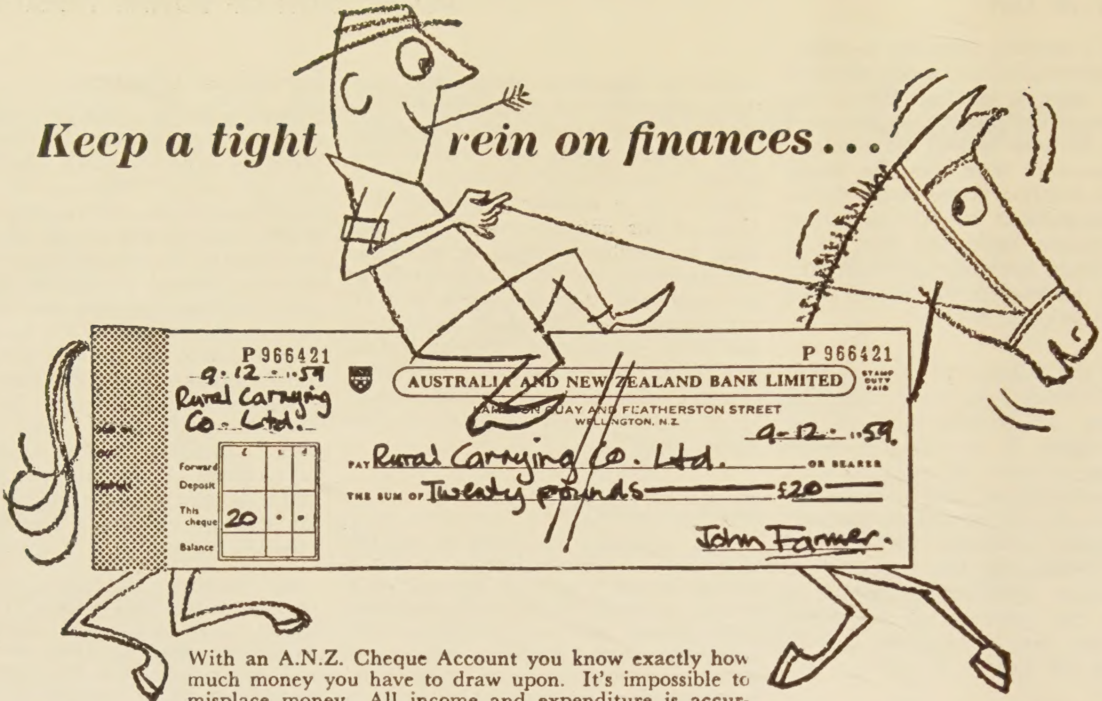
The spread of infection will depend on many factors: the situation of the farm, the type of animal management, and the use or otherwise of common drinking troughs and feeding troughs. It will depend, too, on the situation of the lesions in the already infected animals. If these are in the lungs, for example, the animals are likely to cough tubercle germs on to the pasture and into the air and infection of other animals will be more rapid. Otherwise infection may be spread from the digestive tract in the excreta. Actually in New Zealand lung tuberculosis is not the common type, and infection is spread mainly through the swallowing of contaminated pasture and water.

In practice, therefore, the first tuberculin test will remove all animals which have harboured germs long enough to sensitise their tissues, but will not ensure that the herd is free from the tubercle bacillus or the farm from contamination. Repetitive testing at intervals until two clear consecutive results are obtained is necessary to weed out subsequently infected animals and those which at the time of the first test may not have carried the bacillus long enough to be sensitised. Obviously, too, to achieve eradication all replacement animals must be tested.

When a herd has been declared clear of tuberculosis or shows only very few reactors the problem of non-specific reactivity assumes greatest importance. If, for example, after a herd has shown two clear consecutive tests a number of reactors appear on a subsequent test, the veterinarian in charge will consider very carefully all possible facts relating to these animals before deciding that as reactors they should be condemned. He will go over the complete testing history of the reactors and of the whole herd; he will inquire closely into the testing of replacement animals and into any movements of the herd relative to other herds in the district.

Short Thermal Test

If he is satisfied that there is no evidence that infection has entered the herd, there is one more tuberculin test, called the Short Thermal Test, which he may use to help to determine whether these animals are tuberculous or are non-specific reactors. In this test tuberculin is injected right under the skin and a series of temperature readings are taken, the first just before injection and four more at two-hourly intervals. If the animal's temperature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rises within this period, it is almost certainly tuberculous; if there is no rise, the positive reaction already determined must be non-specific.

The farmer will ask at this point, "If the Short Thermal Test will distinguish tuberculous from non-specific reactors, why is **this** test not used throughout?" The answer is that the Short Thermal Test is infinitely more expensive both in material used (it requires 40 times as much tuberculin as in the ordinary test) and in skilled attention (it requires expert attendance on the animal for over eight hours).

The ordinary tuberculin test has all the requirements for detection of tuberculous animals in a herd, and it is only after these have been removed that there is sufficient possibility of non-specific sensitivity to justify further discrimination by an expensive additional test. Moreover, to this test also there will still be a few animals affected with Johne's or one of the other diseases allied to bovine tuberculosis which will give a positive reaction. The Short Thermal Test, therefore, though helpful, will still not provide 100 per cent discrimination between tuberculous and non-specific reactors.

In tuberculosis eradication schemes in New Zealand every effort is made to ensure that no non-tuberculous animal is slaughtered; but also, and of much greater importance, every effort is made to see that no tuberculous animal is overlooked.

Common Questions

It may be helpful to summarise answers to some questions commonly asked.

What is a Non-visible Lesion Reactor?

An animal which has reacted positively to the tuberculin test, but in which on post-mortem examination no lesions characteristic of the disease are to be seen. It may be:

(a) an animal in whose body the tubercle bacilli are present, but which have not yet produced visible signs of tuberculosis, or

(b) It may be a non-specific reactor.

What is a Non-specific Reactor?

An animal whose tissues have been sensitised to tuberculin by the presence in its body of germs closely related to the tubercle bacillus but not themselves causing bovine tuberculosis. Such germs are those causing tuberculosis in human beings or in birds, causing Johne's disease, or causing skin tuberculosis in cattle.

What is Tuberculin?

A sterile liquid containing chemical substances produced by living tubercle bacilli. Tuberculin itself contains no bacilli either living or dead. It is not a vaccine and therefore gives no immunity to disease in the animal into which it is injected.

It is used to test the sensitivity caused in bovine animal tissues by tubercle germs living in these animals, and so to show whether or not these germs are present in the animals.

What is the Short Thermal Test?

A tuberculin test frequently applied to animals which are positive reactors to the ordinary intradermal tuberculin test but which are suspected of being non-specific reactors rather than positive tuberculous cases. The Short Thermal Test comprises the injection of tuberculin under the skin of the animal and the recording of temperature rise. Its result helps to distinguish non-specific reactors from tuberculous reactors, but the test does not replace the ordinary tuberculin test.

What Percentages of NVL (Non-visible Lesion) Reactors are Encountered?

An example will show how misleading impressions are given by the manner in which these percentages are commonly stated. Over a prescribed period in a Dunedin herd the NVL figure was given as 100 per cent. However, before this figure causes alarm it is necessary to realise that the total number of reactors was only 1.4 per cent of the herd. Actually only **two** animals were involved and both of these were NVLs, hence the very misleading statement that 100 per cent of the reactors were NVLs. Calculated on a **total** basis the percentage of NVLs would be 1.4—giving a very different impression.

Another example will clarify the picture still further. In a total of 4,996 cattle tested 21 were reactors, 0.4 per cent of the total. Of these, 19 were NVLs. It can easily be seen that the statement that 90.5 per cent of the reactors were NVLs is much more disturbing than the equally true statement that 0.38 per cent of the cattle tested were NVLs.

As far as non-specific reactors are concerned the true picture is again that relatively few animals are involved. In 1958-59 of a total of 5,175 reactors non-specific reactivity was suspected only in 419, or in 8 per cent of the animals reacting to tuberculin testing. It is obvious that care must be taken in interpreting figures for NVL and NS reactors.

What Schemes Operate in New Zealand for the Eradication of Tuberculosis?

In New Zealand there are two schemes in operation.

1. A compulsory scheme. This provides for the tuberculin testing of all dairy herds supplying milk for town milk supply. The cost of testing is met by the Government; reactors must be removed at once and replacements must be tested within a month of coming on to the farm. Compensation and loss of production bonus are paid for reactors which are removed.

2. A voluntary scheme. This applies to herds supplying dairy factories manufacturing butter, cheese, dried milk, and other dairy products. The cost of testing is met by the farmer. Reactors are branded at time of testing. If there are fewer than 10 per cent of reactors, these must be slaughtered before the next 1 September (1 October in South Island). If there are over 10 per cent of reactors, these may be retained for up to four years. The owner receives proceeds from sale of carcass plus compensation paid by the Government, which return becomes less the longer the time the reactors are kept on the farm.

The compulsory town milk supply testing scheme started about 1950 and has made such progress that out of the total of 3,000 town milk supply herds, 1,870 herds are already free of tuberculosis and another 600 herds have reached the stage where the disease has been reduced to very small proportions. It is hoped that with the continued cooperation of town milk suppliers New Zealand will soon be able to claim that all herds supplying milk for human consumption in town milk supply are free from tuberculosis.

Last year 191,289 milking animals were tested under this scheme, and 11,000 replacement animals. When the scheme came into operation 7.8 per cent of animals in the town milk supply herds were affected with tuberculosis; the overall incidence has now been reduced to 1.1 per cent.

The voluntary factory supply herd testing scheme came into operation on 1 September 1958. By January 1960 2,608 herds comprising 234,855 cattle had been initially tested of which 10.8 per cent reacted. Two hundred and seventy-five herds comprising 25,098 cattle have been repeat tested, revealing a reactor incidence of 2 per cent and good progress is being maintained.

When all dairy farmers cooperate it will be possible to stamp out entirely a disease which is both unnecessary and harmful to the health of animals and human beings alike.

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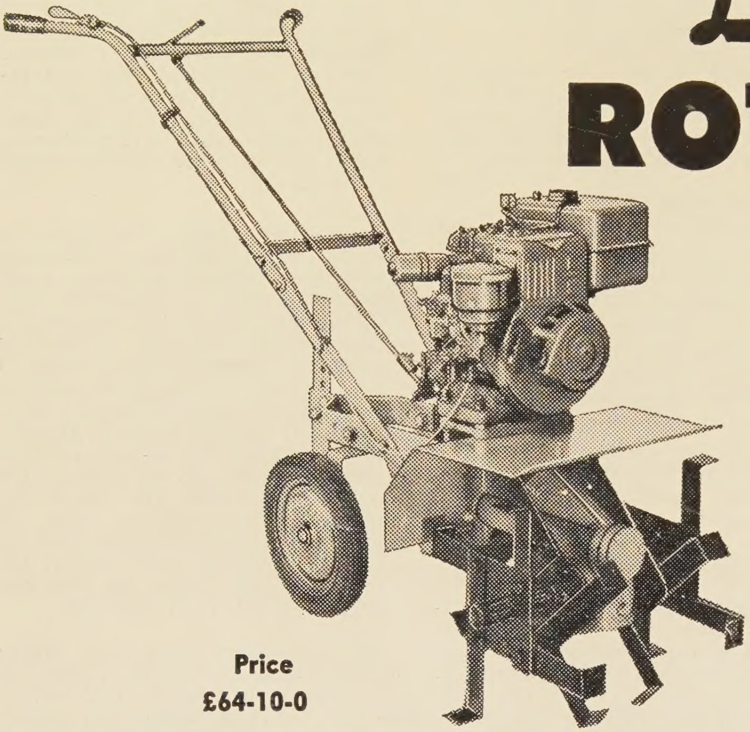

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Efficient Plant-wrenching Machine

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

PLANT wrenching or the cutting back periodically of the longer roots of plants in rows is a necessary but time-consuming part of nursery routine. It is done so that the roots will develop in a thick mass or "ball", subsequent lifting will be easier, and the shock of transplanting will be lessened.

THE work is usually done by thrusting a sharp spade deeply at an angle into the ground along the sides of the plants in a row, but this is laborious and takes time, and rising costs and shortage of labour have forced some nurseries to curtail it, a few to the extent that the quality of the nursery stock has suffered.

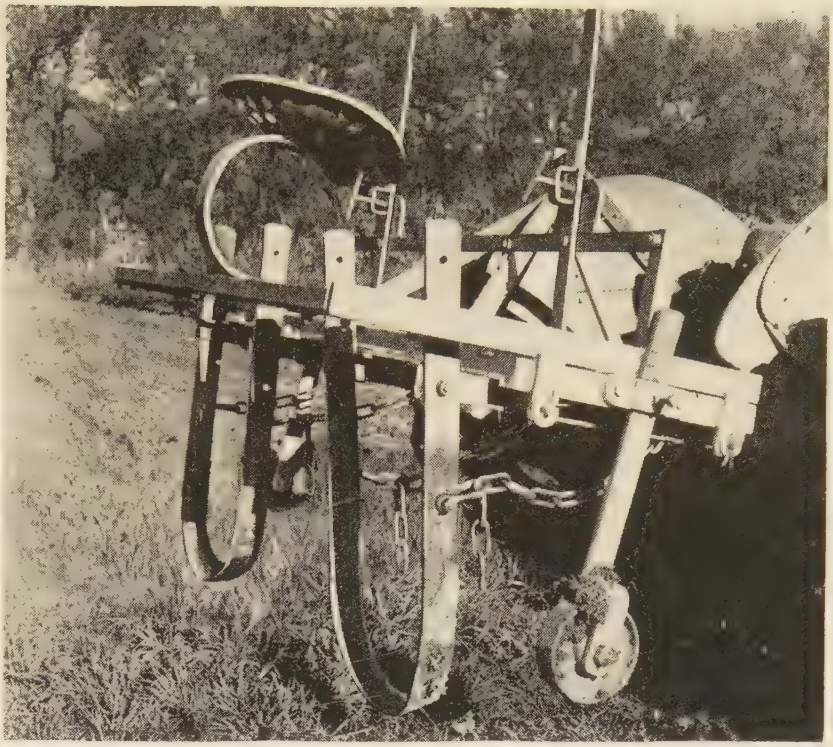
The problem is dealt with effectively by use on the rear of a tractor of the attachment illustrated, which when not in use is held off the ground by the hydraulic system and is lowered for working when the tractor is at the end of the rows to be wrenched.

This equipment wrenches two rows at a time very simply and effectively and as much nursery stock can be wrenched by the machine in two days as previously four men did in a month. The machine shown is an adaptation of another that could do four rows of pines at a time.

In a nursery on the Taieri Plain about 10 miles from Dunedin, with about 20 acres of nursery stock, wrenching by the machine has not only resulted in a great saving of time, but the wrenching is much more uniform.

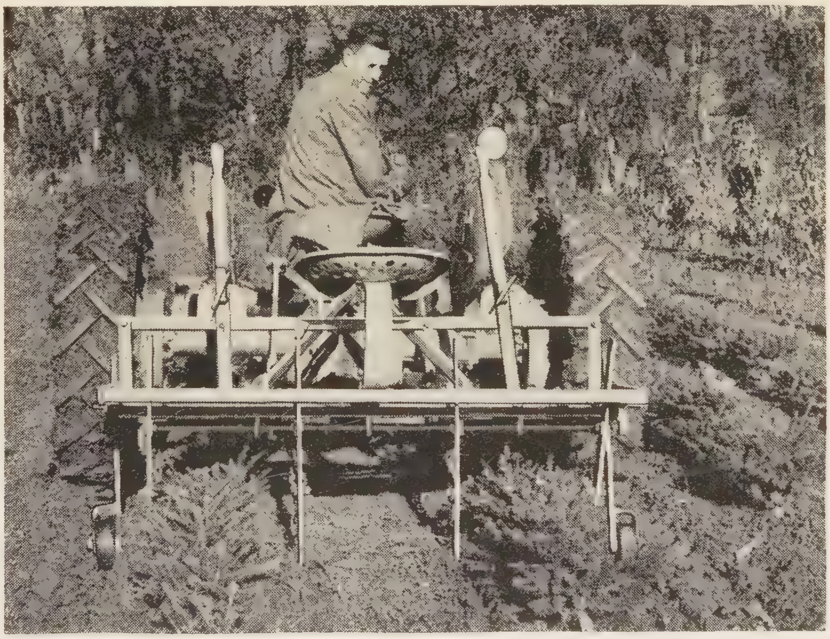
It is considered the machine would penetrate 18 in. deep, but in heavy soils a heavier tractor than that being used at Taieri would be needed for wrenching at this depth.

Comparatively tall plants such as poplars have been wrenched by brushing down the top growth with sacks which are attached under the front and rear axles, and it is intended to make a steel cutter in the form of a J so that young fruit trees, standard roses, and similar plants can be wrenched by working the tractor along the outside rows of blocks of stock, the stock being removed as it is wrenched so that the tractor has access to succeeding inner rows.



The plant-wrenching machine with U-shaped cutting blades.

▼ The wrencher working on two rows of plants.



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By J. A. MILLER,
Livestock Instructor, Department of Agriculture,
Blenheim

WHEN it was found that foot rot in sheep had broken out on two farms in the Kekerangu area Mr B. S. Trolove, who farms in the district and is a member of the New Zealand Wool Board, organised a meeting of all the adjacent farmers to find a way to combat this threat to the district, which until then had a long record of freedom from foot rot.

MR TROLOVE had been impressed by the team methods used on the farms in the Purua area in Northland (described in the March issue of the "Journal") and suggested that similar methods be used at Kekerangu for foot rot eradication.

Lying between Kekerangu and the north bank of the Clarence River in Marlborough Province, the area enclosed, 25,000 acres, starts with a narrow, flat sea frontage, quickly rising by terraces to 1,143 ft at the highest point.

The flats are a well drained gravelly or silt loam growing lucerne and good pasture. The terraces and hills comprise a mixture of soil types derived from a closely folded series of sandstones, mudstones, bentonitic shales, argillites, and conglomerates supporting fair-quality pastures, with manuka scrub in the rough gullies, gener-

[*Barrie Ford*

Portable cradles were used on the shearing floor for examination of sheep and paring for foot rot.

ally well drained but with some wet gullies.

Annual rainfall is about 35 in.

The meeting of farmers in the area resolved to launch a cooperative campaign to deal with the trouble before it became rampant on all farms in the 25,000 acres. Each neighbouring farmer agreed to provide a man to help in mustering, yarding, or paring and examining of feet, and to carry an equal proportion of the cost of equipment (formalin being provided by the farmers on the affected farms).

The farmers on the unaffected properties considered it to be much more economical to assist with an outlay of £4 to £5 per head in equipment, plus labour, which they could divert from work on their own farms, than to improve present stock-proof fencing round each infected property to give sufficient protection, with the possibility of having to fight the disease on their own property if the farmers on the affected farms failed to gain control.

The author of this article, the Livestock Instructor in Blenheim, was then approached. He obtained cradles, foot rot secateurs, and knives, visited the properties, demonstrated foot rot paring to the groups, and advised generally on a scheme of action, including planning of the routes to be taken by the sheep approaching and leaving the shed.

Once the sheep had been inspected, passed as clean, and footbathed in formalin they were returned to spelled paddocks by a clean route. One week before foot rotting began sufficient paddocks were spelled ready to receive the clean sheep.

Mustering was carried out very carefully to ensure that every sheep was examined. A complete muster of stragglers using some of the neighbours as extra shepherds made doubly sure that no sheep were missed in the gullies or scrub.

One property of 1,500 acres carried 1,200 sheep and 120 cattle, and the other property of 5,400 acres carried 1,500 sheep and 120 cattle.

On one farm with 348 affected ewes 142 were sold and the remaining 206 after careful foot paring were footbathed weekly in formalin for the first month, then monthly, and run on to a clean paddock each time. When examined by the owner in four months, no sign of foot rot could be found, and no further signs of foot rot have since been seen on this farm.

On the second farm all infected sheep were treated, footbathed, and

The upper and middle illustrations → show the terrain of the area where the scheme was operated. The narrow, flat sea frontage rises quickly to 1,143 ft at the highest point. Sheep in the lower illustration are being mustered for foot rot examination.

[*Barrie Ford*

[*Barrie Ford*

A line of foot rot free lambs at Kekerangu.

run as a separate mob on the coastal strip until cured, before being returned to the mob.

Team methods using portable cradles on the shearing floor made best possible use of available labour. The same three cradles were used in each shed in turn. Sheep were taken from the catching pens, loaded into the cradles, pared and examined, marked whether they were clean or infected, and released down the chute into the counting-out pens. After drafting, the clean mobs were put in the formalin foot rot bath for several minutes and then released to paddocks that had been spelled for at least a week. These sheep remained clean.

The equipment used was the standard portable cradle used at Purua, which is easily loaded, will swing round with the sheep in it through 360 degrees to give good access to the feet in any position, and is easily unloaded.

Instead of the straight-sided secateurs commonly used at present by farmers the teams at Kekerangu used the curved/blunt type, which enabled them to work quickly and safely, using the curved blade instead of a knife, though at times well sharpened knives were used for fine paring.

Routine examination by a supervisor of all the sheep pared by the team before the sheep were marked "clean" or "infected" and tipped out of the cradles ensured the same high standard of work throughout the flock.

The farmers very soon became used to the new equipment, and to the routine of examination of all sheep by one supervisor before the sheep were tipped out for drafting.

In January 1959, 18 months after these operations took place, the area was visited by C. R. Ensor, then Veterinarian in charge of the Purua scheme, and now Livestock Superintendent, Department of Agriculture, Palmerston North. He could find no signs of foot rot infection in the mobs of dry ewes on both farms. These mobs were chosen because they contained ewes of all ages and from both the mobs which were originally classed as clean and those which were infected when eradication was carried out.

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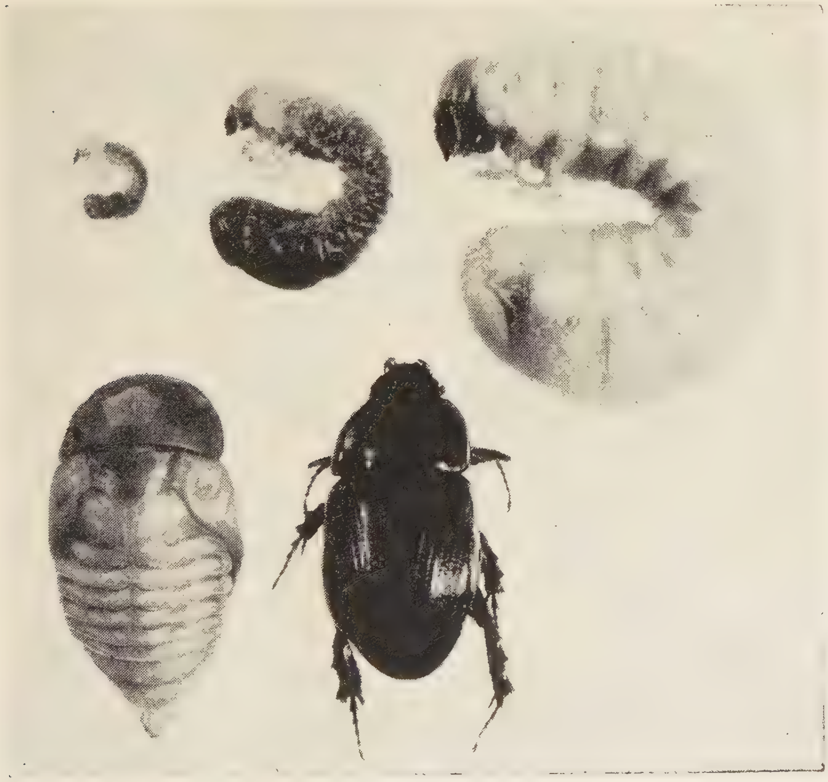
Meteorological Records for February

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	240	68.2	+ 2.6	83.4	51.7	5.52	16	+ 1.35	1.56	4	150
Auckland	160	67.8	+ 1.4	83.2	54.2	7.28	16	+ 3.37	1.74	4	186
Tauranga	12	66.0	+ 1.0	79.3	46.1	10.15	16	+ 6.42	3.81	3	167
Ruakura	131	65.5	+ 2.2	85.0	43.0	6.17	15	+ 3.09	2.03	4	183
Whakarewarewa ..	1,006	63.9	+ 1.5	82.4	41.9	10.21	15	+ 6.29	3.66	3	164
Gisborne	14	66.2	+ 1.1	85.0	44.0	5.31	16	+ 2.26	1.42	22	146
New Plymouth ..	160	64.2	+ 1.7	76.6	45.4	4.64	10	+ 0.66	2.03	4	206
Karioi	2,125	60.4	+ 2.8	84.4	34.5	4.84	12	+ 0.79	1.82	4	—
Napier	5	66.6	+ 1.2	86.1	46.9	3.59	11	+ 0.91	2.01	4	165
Wanganui	72	66.6	+ 2.9	84.6	43.3	4.48	13	+ 1.51	2.05	4	193
Palmerston North ..	110	64.2	+ 1.7	84.9	40.1	3.18	13	+ 0.09	1.19	2	174
Waingawa	340	62.9	+ 0.5	84.5	37.1	2.20	12	— 0.61	0.90	4	169
Wellington	415	61.5	+ 0.2	78.8	45.9	5.15	11	+ 1.87	2.53	2	215
Nelson airfield ..	5	63.0	+ 1.8	79.6	43.2	6.48	9	+ 3.86	2.83	2	234
Blenheim	12	63.6	+ 0.8	84.3	38.8	2.81	8	+ 0.67	1.67	2	226
Hokitika	15	59.2	+ 1.1	77.1	40.0	9.39	18	+ 1.66	2.21	2	196
Hanmer	1,270	59.5	+ 0.1	83.0	34.0	2.70	9	— 0.95	0.64	2	185
Christchurch ..	22	60.6	— 0.2	86.2	43.4	1.03	9	— 0.77	0.24	18	182
Ashburton	323	62.0	+ 1.0	88.6	39.8	1.24	9	— 1.45	0.53	12	185
Timaru	56	60.6	+ 0.4	77.6	42.1	1.65	9	— 0.57	0.67	12	178
Alexandra	520	61.5	+ 0.1	85.5	39.2	2.60	9	+ 1.13	1.77	5	213
Taieri	80	57.4	— 0.3	83.4	34.7	2.90	13	+ 0.59	0.48	9	181
Invercargill airfield ..	0	54.9	— 1.3	76.8	33.8	5.31	18	+ 1.96	0.97	9	190
Chatham Islands ..	150	59.1	+ 0.7	69.2	42.0	3.47	15	+ 1.08	1.34	6	—

Black Beetle *Heteronychus sanctae-helenae* Blanch. Attacking Pastures in N.Z.

By D. H. TODD,
Entomology Division, Department of Scientific and Industrial Research,
Palmerston North

THE black beetle *Heteronychus sanctae-helenae* Blanch. is now an established pasture pest in New Zealand. The beetle was first recorded in this country in March 1937 from Waiheke Island, and at present is confined mainly to coastal areas north and south of Auckland city and north of Gisborne. Occurrences of this insect in pastures in epidemic proportions result in serious economic loss owing to lower stock carrying capacity, and in some cases even force the sale of stock. Often there is the added cost of cultivation and regrassing. Continued pressure of low populations of black beetle with no visual damage could cause progressive deterioration of botanical composition and a subsequent drop in pasture production. An important feature of the pest is that both the adult and grub forms are directly responsible for damage, and in consequence pasture deterioration is continuous. This article describes the black beetle, its life history and habits, known distribution and spread, and a recommended method for control.



← Stages in the development of the black beetle. Upper, from left—First, second, and third stage grubs. Lower, from left—Pupa and adult.

IN recent years the black beetle has become a serious threat to the grassland economy in certain areas and has brought home the urgency of reducing its depredations.

Description and Seasonal History

The adult beetle is about ½ in. long and when newly emerged is a chestnut colour, but it soon changes to a glossy black. The egg is ovoid, white to creamy white, and about 1/16 in. long.

The grub is similar to the common grass grub, *Costelytra zealandica* White, having the same habit of lying curled up in the soil. However, the grub of the black beetle grows bigger and is about 1 in. long when fully grown. The head is light brown and the body is creamy white or greyish white except for the hind segments, which appear black where the contents of the hind gut are visible through the skin.

The fully grown third and final stage grubs are uniformly creamy white owing to the evacuation of gut contents before pupation. The pupa is at first pale yellow but changes to reddish brown before the adult emerges. Before emergence the adult form is distinctly visible through the pupal skin.

The main overwintering stage is the adult beetle, but owing to some overlapping during the season, pupae and grubs at various development stages are usually found throughout this period. The overwintering adults are relatively inactive and remain so in the soil from June until September. The beetles mate in the soil in spring, and the main generation eggs are found from mid October until early January. They are deposited singly, and are usually found about ½ in. below ground level, though sometimes they have been found at a greater depth. The incubation period is about six weeks early in the season, but this period probably decreases later when soil temperatures are normally higher.

The grubs, which pass through three stages before pupating, are generally found fairly close to the surface and rarely below 4 in., and pupae are found at similar depths. The new generation beetles emerge through March, April, and May, with a small number appearing in February. By

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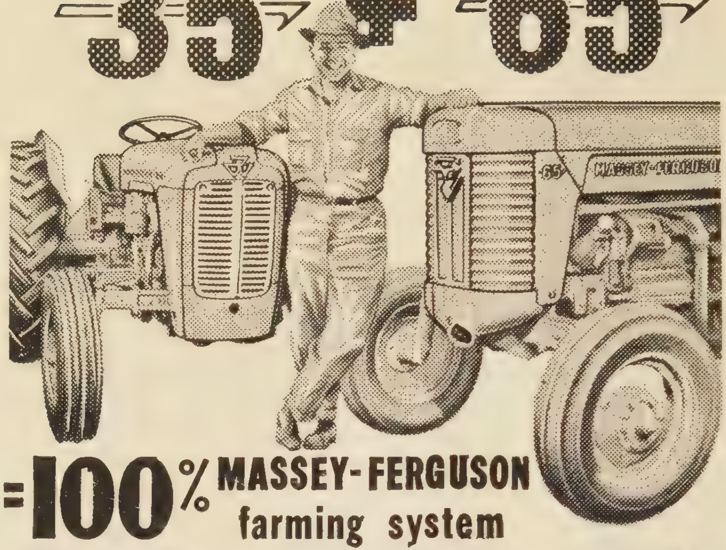

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June most of these have become dormant and remain so throughout winter. In spring they resume feeding and continue to feed until December, after which they gradually die off. It is usual to find many dead beetles on the ground at this time of the year, and very few live beetles can be found until the new generation begins to emerge.

There is only one generation per year, and during the 12 months' cycle old generation beetles are feeding from late September until December, and new generation beetles from March until June, a total feeding period of six months. The principal feeding period of the grubs is from December until February and sometimes into March. On account of varying climatic conditions and seasonal trends there are probably slight variations in the life cycle of the black beetle from one season to another and from place to place.

It is interesting to compare the life cycle of the grass grub with that of the black beetle. The adult beetles of the grass grub begin to emerge in early November, but of course this stage of the pest is not responsible for damage in pasture. The eggs, which are found from about this period until early December, are deposited in clusters and at a greater depth than those of the black beetle. The grubs also pass through three stages before pupating, and feed from late November until at least July (eight months). The grass grub overwinters in the third grub stage, and pupation occurs from late August onward.

The chief breeding grounds of the black beetle in New Zealand are grassland pastures, particularly those in coastal areas, where the soil is usually light, sandy, and friable. The insect also prefers peaty soils. Its association with these soils may be due to the high content of organic matter, some overseas investigators claiming that grubs use this organic matter as a food source.

Large populations have not been found in either the heavier types of soil or in hill country. It is therefore considered most unlikely that epidemic outbreaks would occur under these conditions.

Paspalum pastures are most susceptible to black beetle invasion, and when infestations are heavy the paspalum may disappear completely. In many cases this leaves bare ground which is later invaded by clover, flat weeds, thistle, and undesirable grasses.

Apparently suitable breeding grounds determine whether the black beetle can increase sufficiently to be a menace. However, even under optimum conditions it is not usually until the third or fourth season after the initial infestation that pasture damage becomes conspicuous. Under conditions of drought and overgrazing this would no doubt occur sooner.

Paspalum turf in peat country rolled back to show loss of root system caused by black beetle grubs.

As black beetle damage in pasture is similar to that produced by grass grub, there is no doubt that the grass grub has often been wrongly blamed.

Most pasture grasses are open to black beetle attack, but weeds and legumes are not favoured by the pest and are virtually exempt from attack. Two grasses (*Phalaris tuberosa* and kikuyu) are reported as being able to withstand very heavy beetle infestations. In addition to pasture types the plants attacked are maize and sweet corn, tomato, potato, sweet potato (kumara), carrot, cauliflower, strawberry, tobacco, marigold, and grapevine cuttings. Adult beetles have also been found tunnelling into windfall apples, quinces, and feijoas.

The adult beetle, which spends a large part of its time in the soil, is voracious and when attacking pasture plants feeds mainly on the root system immediately below ground level. Crown damage of cocksfoot has been observed. Adult beetles do not appear to be adversely affected by wet conditions and are able to tolerate long periods of submersion in water. Beetles tend to favour the drier situations as overwintering sites and are often found beneath rushes and under dung pats. Reports have been received from reliable observers of massed flights of beetles in heavily infested areas, particularly during warm autumn evenings. These flights are considered to be the chief means of natural dispersion.

In New Zealand it has been found that grubs of the black beetle can damage the root system of pasture plants. This was demonstrated in an experiment to assess the susceptibility to and nature of damage sustained by some of the more commonly grown grass species when exposed to attack by the grubs. Ryegrass plants exposed to first and second stage grubs died after five weeks, the grubs having completely chewed through the plants just below ground level. Paspalum and cocksfoot plants used in the experiment were less severely affected, but a significant loss in vigour of each had occurred owing to root damage.

In the field it has been possible to roll the turf back with relative ease to expose the grubs, which were obviously feeding on the root system of the pasture species. Grubs are not able to endure long periods of submersion in water, and in areas prone to flooding there is a fairly high grub mortality due to drowning. In peat soil, which usually has a fairly high moisture content, grubs tend to be concentrated in higher situations where the soil is drier. On undulating country not subject to flooding they are often found more abundantly on slopes, particularly those with a northerly aspect.

From observations in the field it is apparent that a form of milky disease is responsible for substantial mortality in overwintering grubs and pupae.

Mortality appears to be much higher where the soil is persistently wet and it seems certain that this disease plays an important part in the natural control of black beetle in the field.

Distribution and Spread

Since its arrival in New Zealand the black beetle has spread both north and south of its initial point of establishment with sporadic outbreaks of epidemic proportions in coastal regions. The most northern recordings are Dargaville on the west coast and Mangawai on the east coast. The southern limit of continuous distribution of the insect appears to be a line which runs roughly between Waiuku on the west coast and Tairua on the east coast of the Coromandel Peninsula. Reports have been received of beetles at Gisborne, and current information indicates that the insect has spread a considerable distance up the coast from this point.

The general pattern of distribution and spread of the black beetle appears to be related mainly to pasture and soil type and texture. In addition to natural dispersion flights, ocean currents and tides are no doubt important factors in the spread of the beetle and probably account for the sporadic and isolated outbreaks in coastal regions. Large numbers of live adult beetles are often carried out to sea by streams and open drains, particularly after flood waters have covered their breeding grounds. It is possible for currents and tides to carry the beetles to other points along the coast where, if conditions are favourable for breeding, the pest will become established. Rapid transport of sheep from one part of the country to another may possibly be another method of dispersal. It is not uncommon for live beetles to become caught in the wool of unshorn sheep, and it is likely that the insect has become established in some areas in this manner.

It is considered that the pest has not yet invaded all the country suitable for its survival and that it will continue to extend its range. It is also probable that it already occurs in some areas where it has not yet been recorded.

Control

As the adults of the black beetle are considerably more mobile than the immature stages, and readily move from place to place, control of the pest has been directed against the grubs while they are actively feeding in the soil.

In a preliminary experiment at Clevedon in January 1958 to test a group of insecticides applied to the soil against the grub stages of the beetle, dieldrin showed the most promise. In December 1958 at Pollok this insecticide was tested out at various dosages under normal field conditions in an area known to be infested with first and second stage grubs. The dosages were 4, 8, and 16 oz of active ingredient per acre of a dieldrin-superphosphate dry mix, and 8 oz per acre of a commercially produced dieldrin-superphosphate wet mix. In each instance the superphosphate was applied at 2 cwt per acre.

The results of the trial demonstrated that effective control of black beetle in pastures can be secured with dieldrin at 8 oz of active ingredient per acre as a dry mix in superphosphate. For best results it is recommended that treatments be made about mid September, which is about one month before the first eggs are laid. This would ensure that the dieldrin is in the soil soon enough to be effective against the early stages of the grubs, as there is evidence that third stage grubs show more resistance to the insecticide. If treatments are carried out later in the season, the desired degree of control may not be achieved.

The commercially produced dieldrin-superphosphate wet mix at 8 oz per acre gave rather disappointing results. This is thought to be on account of the dieldrin taking longer to separate from this material than from the dry mix, thus failing to become effective against the early stages of the grub. Though the wet mix is not considered to be inferior in quality to the dry mix, it does indicate the necessity of applying this material earlier in the season than that recommended for the dry mix. It is estimated that early August would be the best time to apply the commercial dieldrin-superphosphate wet mix. This recommendation is tentative, however, and further experimental work will be necessary before it can be fully confirmed.

Overseas it has been stated authoritatively that dieldrin shows a residual toxicity as persistent as that of DDT. In this country DDT gives good control of grass grub in pastures for three years when applied at 2 lb per acre. In view of these facts there is every chance that the persistency of dieldrin in the soil at the rate recommended for black beetle control will prove satisfactory. This aspect of the problem is still under investigation and positive information will not be available until further tests have been carried out.

Precautions

When treating pastures with insecticides certain precautions must always be observed, not only to get the best results, but also to protect stock, beneficial insects, and the people mixing and handling the material. Though the precautions given here are based on those recommended by J. M. Kelsey for control of grass grub in pasture by DDT-treated superphosphate, they are equally applicable when pasture is treated with dieldrin-superphosphate for control of black beetle.

If the materials are to be mixed on the farm, it is best to use a concrete mixer. It takes at least three minutes with the mixer revolving at 25 revolutions per minute to secure an even mix of insecticide and superphosphate. As it is essential to get some particles of the insecticide on each square inch of ground, the broadcasting method of application should be used in preference to drilling. Rotary-type topdressers are not suitable, mainly because it is impossible to get a uniform distribution of the material with this type of machine. Also the insecticide will be blown away before reaching the pasture for which it was intended.

Spray treatments against black beetle in pasture are not recommended. For best results and to ensure that the insecticide will not adhere to the pasture apply insecticide-treated superphosphate when pasture is close grazed and dry. Treatments of wet or long pasture or in winds should always be avoided. Half an inch of rain is probably sufficient to wash insecticide off wet pasture, but not if the pasture has dried with the insecticide on it. Under those circumstances it would most likely take from 2 to 3 in. of heavy rain to wash it on to the ground.

Farmers may have to wait for a month or more before rain falls, but they should keep stock off treated pastures until this happens; otherwise the stock will eat the insecticide before it can be washed on to the ground. If stock eat the insecticide, there is a strong possibility of undesirable effects. Even if the pasture is dry at time of treating, keep stock off until rain has fallen. Do not apply insecticide when clovers are in bloom or bees and other pollinating insects will be killed, poor seed yields will result, and honey production will be affected.

Dieldrin is classified by the Department of Health as a poison and can be absorbed through the skin. Persons handling the material are strongly advised to wear protective clothing, rubber gloves, and respirator.

REFERENCES

The experimental data presented in this article are more fully explained in a paper by D. H. Todd, "Black Beetle *Heteronychus sanctae-helenae* Blanch. in Pastures in New Zealand", in the "New Zealand Journal of Agricultural Research" Vol. 2, No. 6, page 1,262.

ACKNOWLEDGMENTS

Assistance by H. McM. Bull, Department of Agriculture, Auckland, in field studies of the black beetle is acknowledged.

Photographs by Department of Scientific and Industrial Research.

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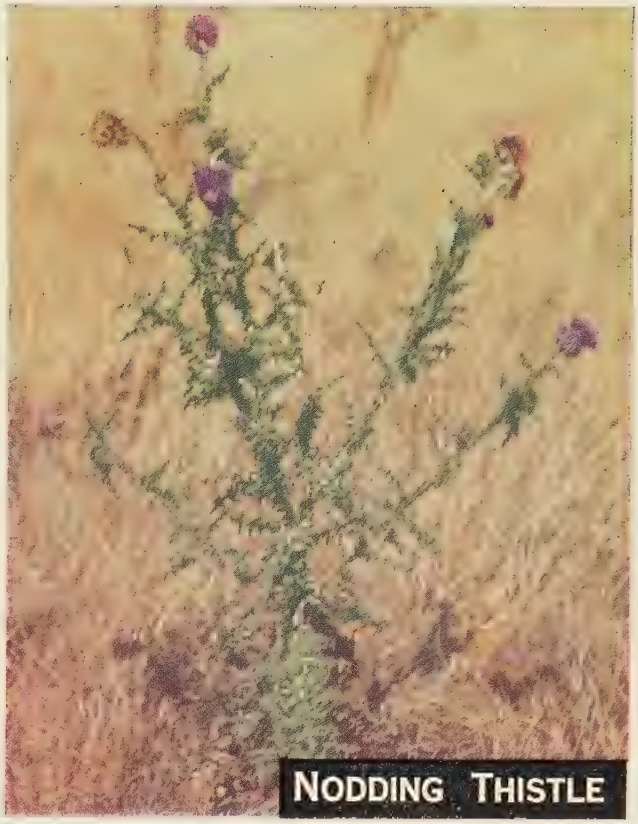
WEED

IDENTIFICATION

AND CONTROL

By L. J. MATTHEWS,
Principal Scientific Officer,
Department of Agriculture,
Wellington

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.



NODDING THISTLE

NODDING THISTLE, like many other thistles, belongs to the daisy family *(Compositae)*. Like Scotch thistle it is a tall and stout biennial, but it does not form as broad or as symmetrical a plant, the branches rising from high on the stem. The stem is cottony, grooved, and, like that of Scotch thistle, is winged for most of its length, but the wings are different in appearance, being much more deeply cut, spineless, and much interrupted so that often they are represented only by a series of prickles with more or less expanded bases.

THE leaves are deeply cut into many narrow lobes pointing alternately upward and downward. Both surfaces of the leaf are more or less covered with short hairs and the veins are woolly.

The flower heads are larger—2 in. or more in diameter—than those of Scotch thistle and are not so elongated and also differ in being drooping and not erect, this characteristic having given the thistle its name. The spines of the involucral bracts are also very distinctive, being three or four times as wide. The florets are of much the same purple colour as those of Scotch thistle, but the pappus hairs are simple and not feathery. It is very doubtful if the seed is carried any distance by the wind. The flowers have a strong and pleasant scent, so that nodding thistle is often referred to as "musk thistle".

Why is It a Weed ?

Until the introduction of modern methods of control nodding thistle was spreading rapidly in New Zealand with increasing production. Unless controlled it can form almost pure associations to the exclusion of pastures and crops. It will not gain entry into a productive closed sward, but after a drought or cultivation it establishes freely, particularly on light and sandy soils. It has been said of nodding thistle that it follows man wherever he goes. It probably originated in North Africa and spread through Europe and Asia in early times. In New Zealand it has spread over Canterbury and Hawke's Bay and other coastal areas in the North Island.

Control

Once nodding thistle has gained entry into a pasture or crop the most effective method of control is with selective weedkillers. It is not normally controlled fully by good farm management, particularly on poorly fenced hill country. Seedlings are killed by salts and amines of MCPA and 2,4-D at rates of up to 1 lb acid equivalent per acre. Seedlings are also susceptible to MCPB and 2,4-DB at the same rates of application.

Its resistance increases with maturity; up to the flower head formation stage it shows susceptibility, particularly to the emulsifiable esters of 2,4-D at rates up to 2 lb, but not to MCPB and 2,4-DB.

Control should be at the seedling stage to minimise clover damage and the smothering effect of the thistle. If the plants are established, two annual applications are probably necessary, one in early spring and the second in autumn. For new pastures MCPB or 2,4-DB at rates up to 1 lb per acre are effective. It is more resistant than Scotch, variegated, and wing thistles, but aerial control in the seedling stage on hill country is satisfactory.

In lucerne adequate control has been obtained with 2,4-DB applied at the seedling stage in the absence of lucerne foliage. It is not controlled by pre-emergence applications of CIPC, CDEC, etc., in onion and carrot crops.

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A Farmer's Experience in

Eradicating Kikuyu Grass by Cultivation

By D. L. JANETT,
Farm Advisory Officer,
Department of Agriculture,
Pukekohe

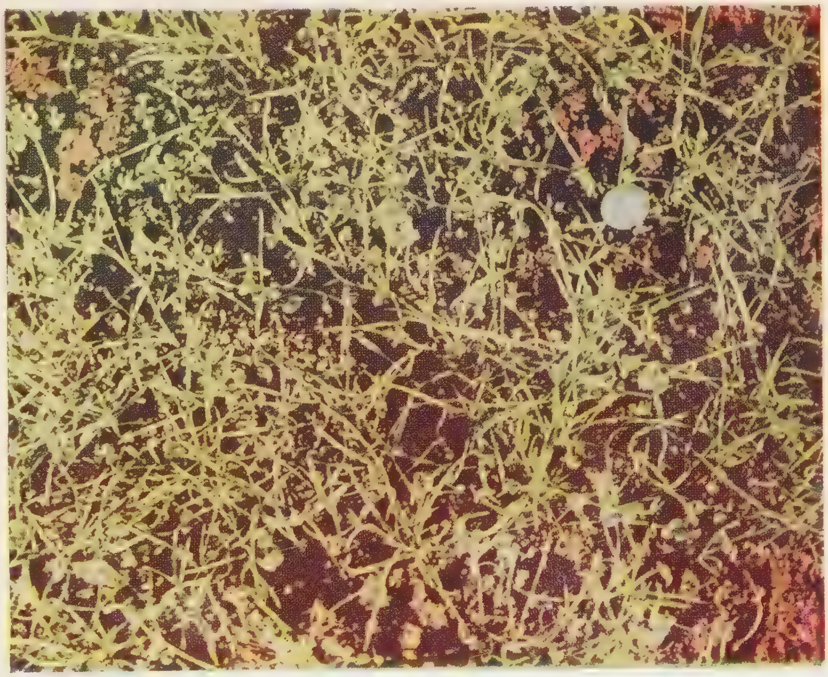
KIKUYU grass *(Pennisetum clandestinum)* was first introduced to New Zealand about 1920 from South Africa, where it has proved a valuable fodder and mat-forming plant. Being a warm climate grass, kikuyu has established mainly in the northern half of the North Island, though it may be found in various parts of the country as far south as Westport. However, as it is very frost tender, it has not established in the colder districts.

WITH its long, trailing surface and underground runners, kikuyu grass, which is a twitch, spreads very rapidly in suitable conditions. If not grazed, it gradually builds up into a thick, deep mat and smothers more valuable species. On sand country kikuyu is a good plant for stabilising moving dunes. However, because of its creeping nature and the ease with which it carries on the feet of stock it will spread and establish on good land, where it can become a serious weed. Wet patches are likely to form where this happens on heavy soils.

ABOUT two years ago a farmer purchased a property in the South Auckland district that was badly infested with kikuyu grass. He decided on an improvement programme whereby he could tackle its elimination step by step. After some 30 to 40 chains of overgrown *Cupressus macrocarpa* shelter belts had been removed the eradication of the kikuyu was attempted in a paddock by cultivation, a method not commonly used in the North Island. In the South Island twitch eradication by cultivation has been common for many years.

The equipment used for the job was a heavy diesel wheel tractor with a rotary hoe attached. A side rake was

The paddock in dense kikuyu before treatment.



Newly sown pasture, showing the absence of kikuyu grass and the good strike obtained with proper consolidation.

Dying roots and stems of kikuyu exposed after two rotary hoeings. These could now be raked up and burnt.

used when required to rake up the dead kikuyu roots for burning.

In the first season cultivation with the rotary hoe was started in early January, when the kikuyu-dominant sward got its first cut. This was difficult, because the thick mat of grass prevented the tines from reaching the ground. The two subsequent hoeings were given at 2- to 3-weekly intervals as the surface trash dried out.

These hoeings penetrated and lifted the kikuyu roots to the surface, where they died; if plentiful enough, they were gathered together and burnt.

Permanent pasture 18 months after sowing, completely cleared of kikuyu grass.

By the end of February a fourth hoeing of the area finished the major cultivation. The paddock was then harrowed twice and sown to chou moellier. Though this late sowing gave a fair crop, it was decided in the second season to advance the cultivation programme by one month, the first hoeing being done in December immediately after a crop of silage had been taken. Through better hoeing a greater kill of kikuyu grass was obtained over the first summer.

Drilling with Turnips and Millet

After the winter crop had been grazed, the paddock was hoed twice and in October was drilled partly with 12 oz of turnips per acre and partly with 20 lb of millet per acre with 3 to 4 cwt of serpentine superphosphate.

Both crops were grazed during summer, and by early February cultivation was begun again. Three or four cuts with the hoe were then given at fortnightly intervals, after which the ground was loose and fluffy. Before the paddock was sown down to permanent pasture consolidation was obtained by three harrowings and a rolling. The seed mixture for sowing consisted of certified seed containing 25 lb of perennial ryegrass, 5 lb of short-rotation ryegrass, 5 lb of cocksfoot, 2 lb of white clover, and 2 lb of cowgrass per acre. Four hundredweight of superphosphate was also included.

The accompanying illustrations show how successful this method has been. Pastures that were previously a mat of kikuyu, producing very little milking feed, have now been changed to good high-producing ryegrass-white clover swards.

Effectiveness of Rotary Hoe Working

Rotary hoe working has been excellent in aerating the soil and bringing the kikuyu roots to the surface. Once there, they have perished quickly, especially in the dry months of January and February. Had the summers been really dry, all the kikuyu might have been killed in one fallow. However, as most seasons are variable, the chances of a complete kill in any one summer are slight. Therefore it is desirable to continue working for a second season to ensure that all the kikuyu is dead.

Consolidation of the seedbed is most important, because the ground becomes very loose with the frequent rotary hoeings. Several harrowings and rolling give a good seedbed.

Turkey Breeding in New Zealand

By J. H. JONES,
Poultry Instructor, Department of Agriculture,
Oamaru

THOUGH turkey production in this country is only in its infancy, the increasing interest in turkeys indicates that the industry could expand. At present the principal demand for turkeys is at Christmas and this demand is being reasonably satisfied, but an effort by the turkey industry to make the turkey popular throughout the year will be needed to enable the industry to expand. This article on turkey breeding discusses general requirements for those considering entering the industry, the qualities required in breeding stock, and the housing systems suitable under different conditions. A second article in the May "Journal" will discuss feeding, general management, and incubator management.

[*Lloyd*

A Mammoth Bronze gobbler. This breed is the most popular one in New Zealand.

FOR many years turkey rearing was considered a mystical art handed down through generations, but this myth no longer exists and turkeys are reared successfully in all parts of the country. The management of turkeys is being more fully understood and disease prevention methods are more widely known. Success in turkey rearing, as in all other branches of poultry keeping, depends on good stock and good husbandry.

Important Requirements

To anyone contemplating turkey farming, or the breeding and rearing of a turkey flock on a large scale, it is of the utmost importance that prior consideration be given to: (a) The breed, strain, and type of turkey to be reared; (b) the facilities to process, pack, and freeze the carcasses in June or July until the following December, and (c) the sales facilities to sell the birds at a price satisfactory to grower, processor, and housewife alike.

Once these important factors have been clarified the grower is free to decide what system of breeding, rearing, and growing to use—the intensive, straw yard, or open range. All three systems can be equally successful, but the capital cost of equipment and housing can vary enormously.

The basic requirements of the market must be the chief influence on the producer before he chooses his turkey stock. As stated before the principal demand in this country is at Christmas, when a small or medium size turkey, 10 to 16 lb, is desired. This type of bird, mainly for family consumption, is suitable for smaller families and modern ovens. The larger birds are used mainly by hotels and shipping companies.

In America, where the consumption of turkey meat is the highest in the world, emphasis is placed on breeding a truly mammoth turkey of between 50 and 70 lb. The meat from these birds is stripped from the carcass and processed into turkey roll, much used by the catering establishments of that country for the filling of sandwiches which are reported to be the cheapest meat-filled sandwiches on the market in America today.

The type of turkey necessary for profitable production grows rapidly, has little mortality and few vices, is of good body type, and is well fleshed, especially over breast and thighs. These birds, if of popular weight, generally command a premium price. Correlated to this, from a breeder's point of view, must be such factors as adequate egg production and high fertility and hatchability. These desirable factors are not arrived at by chance and can be obtained only by hard selection and good management.

In New Zealand there is a very limited range of breeds, the majority of birds being of the American Mammoth Bronze variety, with a few White Hollands. However, intensive selection by a few breeders has so improved some strains of American Mammoths that they could now justifiably be termed Broad Breasted Bronze, which has a blocky conforma-

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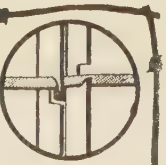

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tion with broader breast and shorter leg than the Mammoth.

The final weight of the finished Christmas turkey will vary according to the strain rather than the breed, the general management, and freedom from disease. The average live weight of a well reared Broad Breasted turkey at 28 weeks of age would be 20 to 28 lb for males and 12 to 18 lb for females.

Some males of the larger strains will attain well over 30 lb if allowed to reach full maturity.

As will be evident, one of the turkey breeder's biggest problems while trying to breed meaty carcasses is to keep the weight and size of the birds, especially the males, down to a reasonable level that can be accommodated by the housewife's oven and purse. For this reason the Americans have developed a smaller breed of turkey known as the Beltsville Small Type White, which unfortunately is not available in this country. This breed of turkey, though not quite as good as the Broad Breasted Bronze in its ability to convert grain and mash into turkey meat, is by its earlier maturity, better egg production, and handier carcass size gaining much popularity in Europe and America.

Few commercial breeders are yet offering day-old poults for sale and those wishing to rear turkeys on a large scale must breed and incubate their own replacements. Turkeys are still hatched naturally or with broody hens, but obviously by this method only small numbers of poults can be raised. If turkey raising is to expand it must, like the poultry industry, increase efficiency by use of all the latest techniques and modern equipment.

Keeping a Breeding Flock

Anyone who contemplates rearing a flock of turkeys on a commercial scale, say 500 to 5,000 per annum, must work to a programme. Initially eggs or poults can be bought and reared (preferably by hens) and then run on open range until, at maturity, there will be a flock large enough to allow a rigid selection of the most suitable breeding types. Two major qualities required are:

(a) Health and stamina
(b) Meat production qualities

(a) Health and Stamina

Selected birds should be well grown, in sound condition, with outstanding constitutional vigour, free of disease, and tested for pullorum disease.

(b) Meat Production Qualities

Select for the compact and well balanced bird of the size to meet market requirements. Good conformation is obtained by selecting for stock with a broad back, moderate depth, and a good width of body. Of special importance are a long, straight keel parallel to the line of the back, moderately short legs set well apart, and a short neck.

The breeders should carry abundant supplies of meat on breast and thighs. The breast should be broad and plump, with the meat right to the end of the breast bone, and the thighs should be well developed.

Great care must be taken in selecting the male birds. Flat-sided or short breast bones must be avoided at all costs, as must, too, the huge, lanky gobblers that are often the pride of the owner's eye.

Growth rate: Rapid maturing strains are required. Such strains usually have a high food conversion ability and carry an abundance of meat which has required less food per pound produced. The object is to produce a high-quality type of market turkey with little waste and the maximum of edible meat. The stock should be

By intensive selection some breeders have considerably improved some strains of Mammoth Bronze turkeys to produce a bird more suitable for the New Zealand market.

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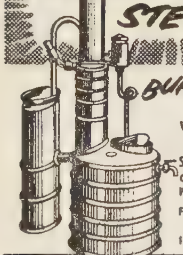

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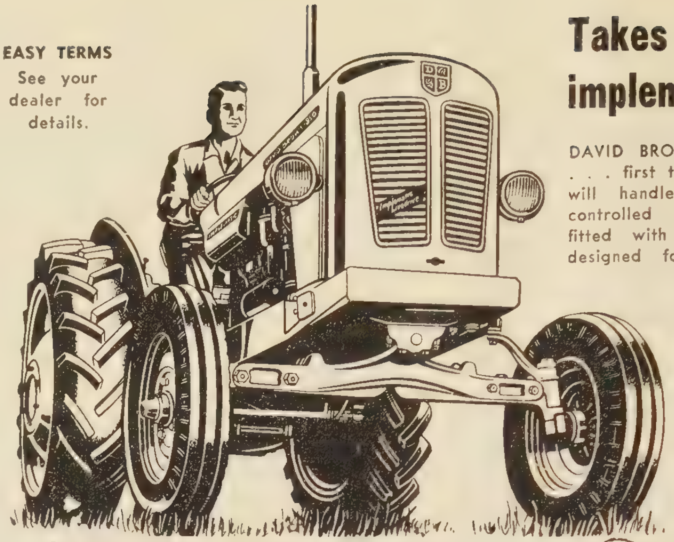

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A turkey breeding pen on free range. Because of New Zealand's equable climate the free range system has been favoured for breeding turkeys if adequate ground is available. It has the additional advantage of low capital cost.

capable of good growth, require a minimum of finishing, and attain a high market grade.

Housing Systems

The selection of breeders being completed (and from an ungraded flock it will be surprising if more than 10 to 20 per cent meet our exacting requirements), the remaining birds can be sold. It must now be decided which system of housing of the breeders is to be adopted. Flocks of breeding turkeys can be housed successfully in any of the following methods.

1. On clean, free range.
2. Semi-intensive with straw yard attached.
3. Fully intensive on deep litter.

Naturally each system has its advantages and disadvantages, and they can be summarised as follows:

1. Free Range

Because of this country's equable climate the free range system has to date found most favour. If adequate ground is available, this system has the advantage of low capital cost. The birds require only rudimentary housing—roofed-over perch platforms or shelters built of straw bales serve admirably in the paddock. Well built, watertight, movable nest boxes, filled with dry, inviting nesting materials are a necessity unless the farmer wishes to spend many hours searching the surrounding hedges and countryside for eggs. These nests, which are about 2 ft square, are best mounted on a row on skids, a unit of five being adequate for 20 breeding hens.

The birds' access to succulent green feed will help materially to keep down feed costs and the exercise, fresh air, and clean living conditions help to keep the breeders in the prime breeding condition so essential for the production of healthy poults. On free range the birds are less likely to suffer from marginal deficiencies of vitamins and minerals as can happen to birds kept under more intensive conditions.

All systems, however, have some disadvantages, and with the free range method there appear to be the ease with which the flock can be depleted by theft and predatory animals, and the discomfort to birds and attendant in wet or cold weather.

2. Semi-intensive

Where little land is available the semi-intensive system holds much advantage for the turkey breeding flock of moderate size. The original idea of turkeys kept in a well built house with access to a grass run surrounded by 6 ft wire netting appears to be losing favour owing to the difficulty of keeping the grass clean and fresh and the ground free of disease.

Many of the grass runs are now being replaced by wire-floored or

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slatted sunporches, and in areas where straw is readily available a yard covered by 6 to 9 in. of straw can be used to advantage. Both these systems of sunporch and straw yard allow the breeding birds access to direct sunlight and, more important still, allow the male birds to get away from one another and so prevent fighting, which is most detrimental to fertility.

Where breeding stock is housed semi intensively, about 8 sq. ft. of floor space per bird in the house should be allocated, with a similar amount of sunporch or straw yard, making in all 16 sq. ft. per bird. The more space that can be allowed the better the results will be.

This system has a disadvantage over the open range in the increased cost of housing and litter and the work needed to clean beneath sunporches and continually add straw to the yard.

More fighting among the male birds can be expected if the unit is run on a flock basis, and subsequently more replacement males will have to be carried. On the other hand egg collection, which in all systems must be two or three times a day, is simplified and the birds can be kept under lock and key.

3. Fully Intensive

Keeping turkey breeders in fully intensive conditions on a commercial scale is only of comparatively recent origin and has been mainly pioneered in the United States, where many millions of birds are kept under this system. With the ever increasing knowledge of turkey nutrition, assisted by disease control measures and drugs to combat the major turkey diseases blackhead and coccidiosis, the keeping of intensive flocks of up to a thousand turkey breeders in one pen is now commonplace on farms in America.

As in all poultry farming progress, the emphasis shifts more and more to specialisation, intensification, and mechanisation, and nowhere is this more obvious than in turkey breeding. Turkey breeding flocks in many parts of the world are now being kept in intensive conditions in a drive for more eggs per bird, higher hatchability without interference by the weather, and more birds handled per unit of manpower. In many turkey houses in the United States breeders are being crowded in at the rate of one bird to 4 sq. ft. Naturally this would not be possible if the houses were not fully insulated, fan ventilated, and equipped with automatic feeding, watering, and manure pit cleaning equipment.

As must be realised such intensification necessitates a high degree of stockmanship and an efficient programme of hygiene and medication. A word of warning is necessary here—unless the owner has a full knowledge of modern equipment and drugs, he should not breed from turkeys kept intensively.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during May as follows:

1XH Hamilton, 12.33 p.m.

9 May—“Farming in the Raglan County”, by J. D. Currie, Farm Advisory Officer, Department of Agriculture, Hamilton.

16 May—“Transport and the Farmer”, by M. G. Hewitt, Federated Farmers, Hamilton.

23 May—“Control of Internal Parasites in Sheep”, by D. Bilkey, Livestock Instructor, Department of Agriculture, Hamilton.

30 May—“Silage Facilities”, by J. L. Doutre, Machinery Instructor, Department of Agriculture, Hamilton.

2XG Gisborne, 8 p.m.

3 May—“Stockowners’ Question Time”, by E. B. Smythe, Livestock Instructor, Department of Agriculture, Gisborne.

10 May—“For the Orchardist”, by J. D. Overbye, Horticultural Instructor, Department of Agriculture, Gisborne.

31 May—“Farm Shelter”, by R. S. Whitehead, Fields Instructor, Department of Agriculture, Gisborne.

2XA Wanganui, 8 p.m.

5 May—“For the Country Woman”, by Mary Macdonald.

12 May—“Farming News”.

19 May—“Tackling Sow and Piglet Ailments”, by C. M. Bailey, Supervisor, Taranaki District Pig Council.

26 May—“Poultry Notes”, by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

1YZ Rotorua, 7.15 p.m.

4 May—Young Farmers’ Clubs Session, by Matamata Y.F.C. district committee.

18 May—“Some Aspects of Seasonal Work on Pumice Country Farms”, by C. R. Taylor, Farm Advisory Officer, Department of Agriculture, Rotorua.

2YZ Napier, 7.10 p.m.

3 May—“Winter Feed”, by F. H. Collin, Instructor in Agriculture, Department of Agriculture, Hastings.

17 May—“Stock Diseases”, by Veterinarian, Department of Agriculture, Hastings.

31 May—“Soil Conservation”, by S. T. Anaru, Farm Advisory Officer (Soil Conservation), Department of Agriculture, Hastings.

2ZA Palmerston North, 12.36 p.m.

9 May—“Care of Sow and litter”, by D. R. Thomson, Livestock Instructor, Department of Agriculture, Palmerston North.

23 May—“Feeding Dairy Stock”, by J. A. Graham, Instructor in Agriculture, Department of Agriculture, Palmerston North.

2XP New Plymouth, 8 p.m.

5 May—“News and Views from the Department of Agriculture’s Farm Advisory Division”, by G. R. Moss, Farm Advisory Officer, Department of Agriculture, New Plymouth.

12 May—“Tanker Collection of Milk”, by A. E. Pain, Dairy Instructor and Grader, Department of Agriculture, New Plymouth.

19 and 26 May—“Radio Vet.”, by J. H. Macdonald, Veterinarian, Department of Agriculture, New Plymouth.

26 May—“News and Views from the Department of Agriculture’s Farm Advisory Division”, by S. H. Henry, Farm Advisory Officer, Department of Agriculture, Stratford.

3YA Christchurch, 12.20 p.m.

2 May—“Winter Work in Horticulture”, by L. C. Hurndell, Horticultural Instructor, Department of Agriculture, Christchurch.

16 May—Review of “The New Zealand Journal of Agriculture”, by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

2 May—“The Case for Ploughing”, by L. H. Weston, Farm Advisory Officer (Machinery), Department of Agriculture, Dunedin.

9 May—“Winter Feeding of Stock”, by C. E. Isaacs, Veterinarian, Department of Agriculture, Invercargill.

16 May—“Cropping Programmes”, by W. Faithful, Instructor in Agriculture, Department of Agriculture, Invercargill.

23 May—“Winter Work with Poultry”, by J. Jones, Poultry Instructor, Department of Agriculture, Oamaru.

30 May—“Farm Ponds”, by J. G. Hughes, Farm Advisory Officer (Soil Conservation), Department of Agriculture, Kurow.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. (“Country Journal”, including “Report from Ruakura”), Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m. (“Country Journal”), Thursdays at 12.33 p.m. (“News for the Farmer”).

1XN Whangarei, Mondays at 8 p.m. (“Northland Stock Market Report”, followed by “Farming for Profit”), Wednesdays at 8 p.m. (“Farming for Profit”), and Fridays at 12.33 p.m. (“Farm News”).

1XH Hamilton, Mondays at 12.36 p.m. (“For the Farmer”, excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. (“Report from Ruakura”).

1YZ Rotorua, Wednesdays at 7 p.m. (“Bay of Plenty Journal”), Thursdays, 12.33 p.m. (“News for the Farmer”).

2YZ Napier, Tuesdays at 7.10 p.m. (“The Hawke’s Bay Farmer”) and Thursdays at 12.33 p.m. (“News for the Farmer”).

2XG Gisborne, Tuesdays at 8 p.m. (“Farm Session”).

2XP New Plymouth, Thursdays at 8 p.m. (“Farm Session”).

2XA Wanganui, Mondays at 8 p.m. (“For the Man on the Land”), Tuesdays at 8 p.m. (“Farm Supplement”), and Thursdays at 8 p.m. (“Farm Topics”).

2XB Masterton, Fridays at 6.45 p.m. (“Farm Session”).

2XN Nelson, Thursdays at 8 p.m. (“Nelson Farm Topics”).

2ZA Palmerston North, Mondays at 12.36 p.m. (“Country Digest”) and Fridays at 8.30 p.m. (“Country Digest”, including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. (“Farm Session”), Thursdays at 12.33 p.m. (“News for the Farmer”).

3YA Christchurch, Mondays at 12.20 p.m. (“Country Session”), Thursdays at 12.33 p.m. (“News for the Farmer”), and 7.10 p.m. (“Home Paddock”).

3XC Timaru, Wednesdays at 8 p.m (“Farmers’ Weekly News Service”) and Saturdays at 10.30 a.m. (“Country Mailbag”).

3YZ Greymouth, Mondays at 12.36 p.m. Thursdays at 12.33 p.m. (“News for the Farmer”).

4YA Dunedin, Mondays at 12.36 p.m., Wednesdays and Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.36 p.m., Wednesdays and Thursdays at 12.33 p.m. (“News for the Farmer”).

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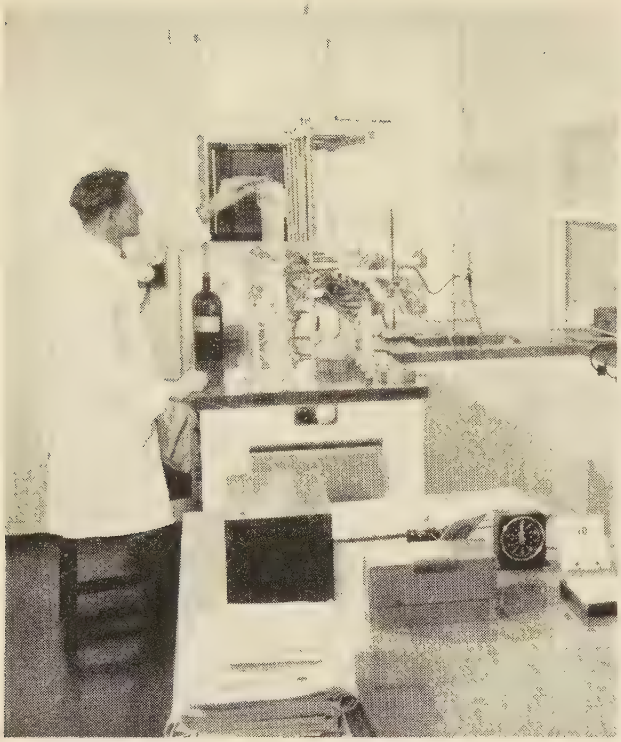

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Current Work and Findings
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Trials and Experiments

Wallaceville

Cobalt Deficiency in Very Young Lambs

Experience suggests that cobalt deficiency is likely to develop in lambs before weaning only if the ewes are also cobalt deficient. Recent experiments on cobalt-deficient land at the Kaitoke farm of Wallaceville Animal Research Station have yielded more precise information on some effects of cobalt deficiency in ewes in relation to their lambs.

Present indications are that cobalt-deficient ewes appear to breed almost normally and carry their lambs to full term. The ratio of twins to singles was lower in the group of cobalt-deficient ewes than it was with normal ewes, though not significantly so. The average birth weight of twin lambs from cobalt-deficient ewes was no lower than the average birth weight of twins from normal ewes. On the other hand the average birth weight of single lambs from cobalt-deficient ewes was significantly lower than the average birth weight of singles from normal ewes.

About six weeks after the average lambing date both twin and single lambs from cobalt-deficient ewes were showing evidence of cobalt deficiency through reduced weight gains. The cobalt-containing-vitamin (B_{12}) content of the livers from cobalt-deficient lambs which died at or near birth was very low and comparable to that of cobalt-deficient weaned lambs.

Other results suggest that ewes given cobalt bullets during pregnancy pass on appreciable vitamin B_{12} stores to the livers of the lambs before birth. Cobalt bullets also raise the vitamin B_{12} content of the milk, but the amount available from this source is small in comparison with the total amount of vitamin needed by the lamb. Cobalt bullets given to pregnant ewes protect lambs against cobalt deficiency from an early age, but present indications are that the protective effect will not last until weaning.

Rukuhia

Fertility Transfer under Ration Grazing

Where pasture is utilised under a system of ration or "on and off" grazing, stock will tend to go into the field empty and come out full. This leads to movement of fertility away from the area so grazed. Such a loss could be serious, particularly where paddocks are managed in this way year after year, as for example with some irrigated pastures.

The extent of this depletion is being studied at Rukuhia Soil Research Station in a small paddock trial under cattle grazing. Though the trial has been in progress only 12 months, the pasture on the ration-grazed fields already appears unthrifty and yield is falling relative to that on the set stocked ones. Soil test figures also reflect the transfer occurring, especially regarding potash.

It is hoped that the results from this trial will provide a basis on which to make recommendations regarding fertiliser requirements for areas utilised in this way.

Ruakura

Pasture Production under Different Stocking Rates and Grazing Systems

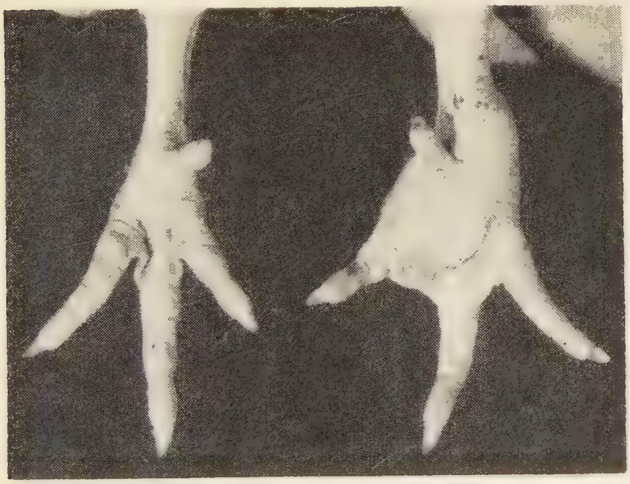
In the well known No. 2 Dairy experiment at Ruakura Animal Research Station similar sized herds are being run under controlled and uncontrolled grazing at high and low rates of stocking. In conjunction with this trial 5 acres within the main farm is being used to measure the effect of these same stocking rates and grazing systems on pasture growth and botanical composition. To simulate uncontrolled grazing, cows from the main herd are maintained continuously at equivalent stocking rates on day and night paddocks within the 5 acre area. Other paddocks within this area have been set aside for comparisons under controlled grazing and are grazed at appropriate stocking rates when corresponding paddocks on the main farm are grazed.

Present indications are that at least during spring and summer more grass is grown under uncontrolled than controlled rotational grazing at both rates of stocking used in the experiment.

Wallaceville

Infectious Synovitis in Chickens

Arthritic conditions in chickens are not particularly common, probably because most chickens are raised on the floor. With the increase in the use of wire cages an increase in arthritic conditions can be expected and incidence of infectious synovitis in this country is confirmed in a report from Wallaceville. It is caused by a virus and the illustration shows the result of inoculating bacteria-free material into the footpad of a chicken. The hock joint is most commonly affected; it becomes enlarged and feels much warmer than the unaffected joint. If any cases of this disease are suspected, advice should be sought from the local Poultry Instructor on the best procedure to adopt.



Rukuhia

Fertiliser Needs of Fruit Trees

Soil samples are being analysed by the Rukuhia laboratories for correlation with the results of an apple leaf analysis and tree nutrition survey conducted by the Fruit Research Division, Department of Scientific and Industrial Research, Auckland. The objectives are (1) to obtain evidence on the practical value of soil analysis under New Zealand conditions as an aid in advice on fertiliser needs of fruit trees in commercial orchards and (2) to determine the relative merits of soil and leaf analysis for this purpose.

Ruakura

High Iron Content in Water May Depress Production

In a trial designed to measure the effect of spray irrigation on dairy production at Ruakura it was found that the milk production of twin cows on irrigated pastures fell below that of their mates and that many scoured profusely. Subsequent investigations showed that the iron content of the water used for irrigation was abnormally high and it was suggested that this was responsible for the fall in production and scouring.

Further dosing trials with twins have confirmed that water with a high iron content does cause scouring and lowered production. Plans are being made to compare the performance of twins having normal and high iron content drinking water.

Rukuhia

Magnesium in Soils

Most soils in New Zealand were originally well supplied with magnesium and in fact even today field trials and pasture analyses give very little indication of deficiency as far as pasture growth is concerned. Cases reported in tobacco, tomatoes, and fruit trees have been attributed to heavy applications of potassium salts causing an imbalance.

In 1942 J. K. Dixon and N. H. Taylor showed that topdressing with superphosphate caused a drainage loss of both potassium and magnesium from the soil. Potassium applications also may lead to increased losses of magnesium. The extent of such losses is being examined at Rukuhia both in laboratory experiments with columns of soil and by examination of soil samples from rates of potash trials. The action of nitrogenous fertilisers is also being studied.

Results from one trial at Rukuhia on Horotiu sandy loam show how, after five years, soil magnesium diminishes with increasing rates of potassium chloride application.

	RATES OF POTASSIUM CHLORIDE APPLICATION (cwt per acre)			
	0	1	2	4
Exchangeable magnesium (%)	0.015	0.013	0.011	0.009

Research to date has been confined to the yellow-brown loam group of soils.

◆

Care of Livestock during May

By the Animal Research Division

BLOOD POISONING IN HOGGETS

BLOOD poisoning in hoggets grazing on turnips is becoming an increasingly important problem. Deaths occur from infection with the blackleg organism, which probably gains entry through the mouth. An excellent vaccine which confers very good immunity can be bought in New Zealand. On properties where losses have previously occurred hoggets should be vaccinated at least a fortnight before they are placed on turnips. The nearest Veterinarian or Livestock Instructor should be consulted about the method of vaccination.

PREVENTION OF SUCKING BY CALVES

Sucking of each other by calves is a habit which should be broken as soon as it is detected. The insertion of a bull ring is effective in most cases.

MILKING MACHINE OVERHAUL

As soon as the cows have been dried off arrangements should be made for the milking machine to be overhauled by an expert. Do not install complicated gadgets, but make sure that all parts of the machine are working efficiently. This will not only ensure rapid, trouble-free milking, but is likely to increase production and will help to reduce mastitis.

INOCULATION OF DOGS AGAINST DISTEMPER

Distemper in dogs can usually be prevented by vaccination. This is best done when the pups are three to four months old.

RED WORMS IN HORSES

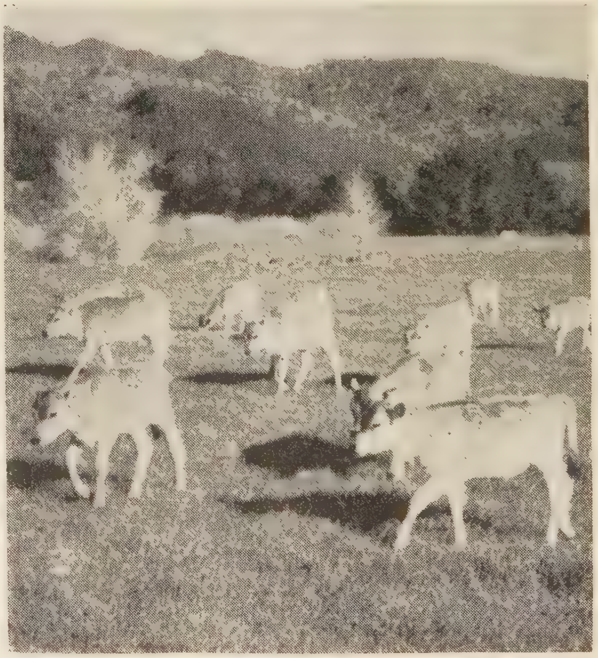
Red worms can seriously reduce the efficiency of working horses and are responsible for many deaths in foals. Phenothiazine is a very effective remedy, but is best given under veterinary supervision, as in certain conditions it may prove dangerous. Animals should be treated before winter.

AUTUMN-SAVED PASTURE

In most districts there is still time to provide good winter grazing by shutting up paddocks and letting them grow during autumn and early winter. Having some pasture cover on paddocks before the first frosts will assist pasture growth during winter. Autumn-saved pasture is invaluable for early calving cows. It also provides the best insurance against sleepy sickness in ewes. If necessary, feed silage to cows now to enable some paddocks to be shut up. Once the ewes have been tupped they are all the better for being done fairly hard until three or four weeks before lambing. This also will enable some paddocks to be spelled.

UNTHRIFTY CALVES

The best feed for calves is good fresh pasture, and this can be provided by rotating the calves through the cow paddocks. Good-quality hay is necessary to supplement the sappy young autumn pasture. At the first sign of unthriftiness calves should be drenched with phenothiazine, being given the full dose recommended on the label. Drenching, however, will not be effective unless the calves are properly fed.



Crop Production; Wheat Varieties

Seasonal Notes by the Farm Advisory Division

THE two new wheat varieties, Aotea and Arawa, bred by Crop Research Division, Department of Scientific and Industrial Research, have over the past few years almost completely replaced the varieties previously used for South Island sowings, while Gabo, a recent importation from Australia, has challenged Tainui as a spring-sown variety for the North Island. General recommendations for sowing are as follows:

Aotea is estimated to comprise approximately 80 per cent of the 1959-60 acreage. Very high yielding and of good baking quality, it is recommended as a general replacement for Cross 7, particularly under high-fertility conditions. It has performed well when spring sown in Southland, but insufficient evidence is available concerning its performance under North Island conditions.

Arawa, estimated at approximately 12 per cent of the 1959-60 acreage, is high yielding, but its baking quality is below that of Aotea. Bred as a replacement for Dreadnought, it has proved very successful. It can be direct headed and does not lodge as readily as Dreadnought.

Cross 7, previously grown on about 75 per cent of the total wheat area, occupied only about 3 per cent of the 1959-60 acreage. It is still a reliable variety for soils of medium fertility, but is susceptible to attack by soil-borne fungous diseases where conditions promote rank growth.

Gabo now heads Tainui in the North Island and is increasing in popularity. It yields well, ripens early, and is resistant to lodging. A tendency to sprout in the ear is a disadvantage in unfavourable seasons.

Tainui was previously the main variety for spring sowings in the North Island. It lodges badly, but is otherwise satisfactory. It is slightly later maturing than Gabo.

Hilgendorf occupied less than 2 per cent of the 1959-60 acreage, but can be recommended for parts of Marlborough and for Mid and North Canterbury, where it yields as well as Cross 7. It is early maturing and its high baking quality commands a premium price.

Dreadnought is still a high-yielding variety for good land provided windrowing is not a problem and if straw is required for covering, etc. It is very susceptible to loose smut, and uncertified seed should not be used if this disease is to be guarded against.

—*N. L. SHILLITO, Christchurch*

* * *

CLEANING OF DRAINS AND IRRIGATION RACES

DALAPON is the most useful weedicide for controlling grasses in irrigation races and along the banks of drains. Rates of application will depend on the growth density, but will vary between 2 lb per acre for short growth to 10 lb for heavy growth. To check growth along the banks it can be applied effectively at any time during the growing season.

In irrigation races dalapon should be given at least a fortnight to be effective and this period should be allowed for in the spring before irrigation begins. When applying dalapon a minimum spell of two to three days' fine weather is preferable; otherwise the result will be disappointing. Weeds not affected by dalapon can be treated with hormone preparations provided they are susceptible.

—*R. C. SCHOFIELD, Timaru*

* * *

"TENSION CURVE" NETTING FENCE

HALF the cost of fencing is in materials and the other half in handling. It is seldom possible to reduce the cost of the materials without lowering the strength or length of life of the fence. But in fencing trials in the Raglan hills the "tension curve" fabricated netting fence has been showing up favourably as a good way to reduce erection costs.

Erection of the fence is very simple. As the rolls of netting are 4 chains long, put in two strainers just under 8 chains apart connected with a No. 8 wire, as a guide for posts at the normal 5 yd spacing.

Anchor one of the coils to each strainer and roll both coils out to meet in the centre. Hook them to the guide wire with C loops and strain them together to be joined at the centre, using clamps made of 4 in. by 2 in. timber bolted across the netting like a sandwich. The netting slides freely on the guide wire. Then unhook the netting and pull it down in the dips and up on the rises, stapling it to the posts. Remove the guide wire and strain a barbed wire along the top, with one batten between posts.

Not only does the "tension curve" permit the netting to follow the contour perfectly, but it also makes the fence decidedly elastic.

—*J. D. CURRIE, Hamilton*

* * *

GREEN MANURING: BETTER MAIZE CROPS

THE mechanical harvesting of maize crops imposes a heavy burden on soil structure, particularly if the soil is wet. Where maize is cropped successively for a number of years in one paddock the soil becomes progressively harder to work; it cracks in dry weather and is sodden in wet weather, especially on silt land lacking in humus. The ploughing in of green manure in the intervals between successive maize crops goes a long way toward increasing yield and preventing these troubles.

Ideally, a leguminous crop such as lupins is best, but often the very conditions induced by over-cropping prevent lupins from growing well. Oats and tares are a good alternative. Sow 2 bushels of oats and 1 bushel of tares to the acre as soon as possible after harvesting the maize. A fine seedbed is not necessary as long as the maize stubble is well chopped up with the discs. Though the green crop can be grazed once or twice when feed is short, it should be remembered that the object is to produce as much material as possible for ploughing under in early spring. Sufficient time must be given to allow the green crop to rot thoroughly before the new crop is planted. This process can be assisted materially by working in 2 cwt of sulphate of ammonia with the green manure.

—*G. J. GRAHAM, Gisborne*

* * *

STORING POTATOES

POTATOES should be stored under dry, sheltered conditions, with protection from frosts and wet weather. Proper ventilation is another essential and this can be improved by stacking the crop on raised platforms or on gratings. However, with table potatoes maximum exclusion of light should be the aim. On no account should wet potatoes be stored in sacks. When handling the potatoes every care should be taken to prevent even slight injury to the tubers, as extensive damage from dry rot can result during storage. It is no use taking a lot of trouble to store potatoes after they have already been damaged.

Potato tuber moth: Seed potatoes may be protected from potato tuber moth attack by dusting with 1 per cent DDT dust at ¾ lb per sack. Each sack should be a third filled with potatoes, ¼ lb of DDT dust sprinkled over them, the second third of the sack filled with potatoes, and then the process repeated. Finally the sack should be filled and topped off with the remaining ¼ lb of DDT dust. Subsequent handling should distribute dust over the tubers, but if the potatoes are to be stored where treated, it may be advisable to agitate the sacks as they are filled. Table potatoes, of course, should not be treated.

—*P. R. BARRER, Christchurch*

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Care of Bees to Avoid Wintering Losses

Seasonal Notes for the Domestic Beekeeper

A CONSIDERABLE number of bee colonies either die out during winter or emerge from it very weak, generally because beekeepers fail to give their bees and hive equipment correct attention during autumn. This article by the Horticulture Division describes the requirements for successful wintering of bee colonies and care of stored bee combs.

A NORMAL colony of bees in mid winter consists of 15,000 to 20,000 workers and a single queen. To sustain life when winter temperatures are low the bees must form a cluster, filling the spaces between the combs until they become a compact spherical mass. The bees on the outside of the cluster form an insulating shell and the bees within generate heat by consuming honey stores and by muscular activity.

The highest temperatures within the cluster may vary between 75 and 85 degrees F, while temperatures at the edges of the cluster may be down to 57 degrees F or as low as 41 degrees F in extremely cold climates, at which point individual bees become chilled and die. As the outside temperature falls, the cluster reduces in size. This compaction by the bees reduces the surface exposed to the heat radiation and allows more bees within to generate heat. On the other hand, if the temperature rises, the cluster will expand.

Ensuring Comfort of Bees

In most parts of New Zealand temperatures are low in winter and bees remain clustered in this manner for most of the time. Therefore the comfort of the bees must be ensured and colonies given every assistance to survive the winter and be in good condition for the following season.

The chief requirements for successful wintering of bees are disease-free colonies strong in young bees, close-fitting, rainproof hives, adequate supplies of food, and protection from prevailing winds. These conditions will enable colonies to survive the most severe winters in any part of New Zealand without attention.

In New Zealand colonies appear to winter best in two full-depth boxes. Sufficient comb room should be left in the middle of the brood nest to allow space for the queen to continue brood rearing and for the bees to cluster comfortably. Where possible the brood should be placed into the bottom box.

The age of the queen must be checked, as her vitality must be unimpaired if she is to carry the hive through winter to spring in a prosperous condition. A young queen will breed right through into winter. This activity provides the colony with a strong force of young, vigorous worker bees to form the winter cluster.

In autumn it is best to leave each colony with one super of fully capped combs of honey in addition to any honey or pollen stored along the upper and outer edges of the combs in the brood nest below. This quantity provides an extra margin of safety in food supplies for winter and early spring. Many beekeepers fail to leave sufficient stores and eventually lose a year's crop through leaving the colony a few pounds short. In most areas there is an abundance of pollen, but it is always advisable to check the combs, for the hive will require at least an equivalent of two full combs of pollen.

Sheltering Hives from Cold Winds

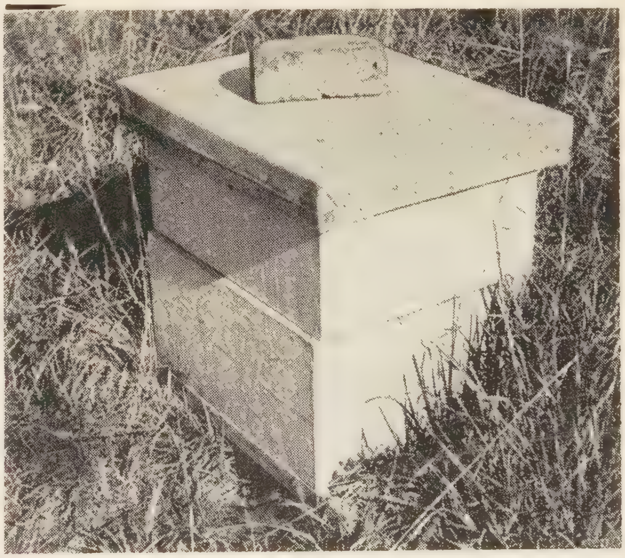
When hives are in exposed positions cold penetrating winds enter the hive entrances and other openings caused by ill-fitting or badly constructed appliances. These conditions should be avoided. Colonies should be situated where they will receive a maximum of sunshine and protection from prevailing winds and cold draughts. Hives should be placed with their entrances facing north so that all sunshine falls on the fronts of the hives. A site with a hedge at the back of the hives which may be trimmed to 6 or 8 ft provides good shelter. A board fence will also make a satisfactory windbreak.

Many beekeepers make the mistake of placing the hives in the shade of trees or under thick, overhanging fences. Bees cannot do well under such conditions, for under trees and hedges they often get more cold draughts than in the open. Hives should be placed far enough away from shelter to avoid shading. Provided the hives are reasonably sheltered and all hive parts are reasonably rainproof and close fitting, the bees are quite capable of maintaining the temperature necessary for their comfort in changeable weather.

Where these precautions are not taken, however, colonies usually open up weak in spring and low in stores; most of the bees also have dark-tipped, shiny bodies indicating worry and loss of vitality through overwork in trying to keep up the normal temperature within the cluster during winter. A combination of damp housing and cold can quickly cause heavy mortality and, if not remedied, the complete loss of the colony.

Avoiding Dampness

Dampness should be avoided at all costs, and if the colony has shown continuing evidence of moisture in the



A hive entrance overgrown with grass, causing obstruction to the flight of bees, bad ventilation, and damp conditions for the colony.

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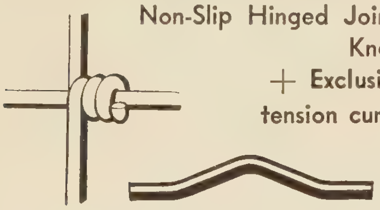

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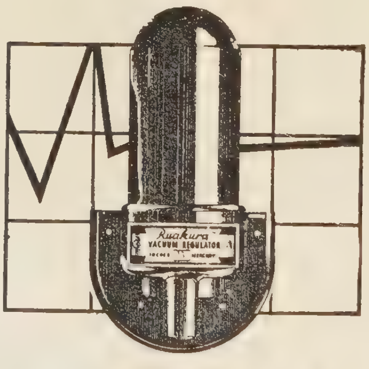

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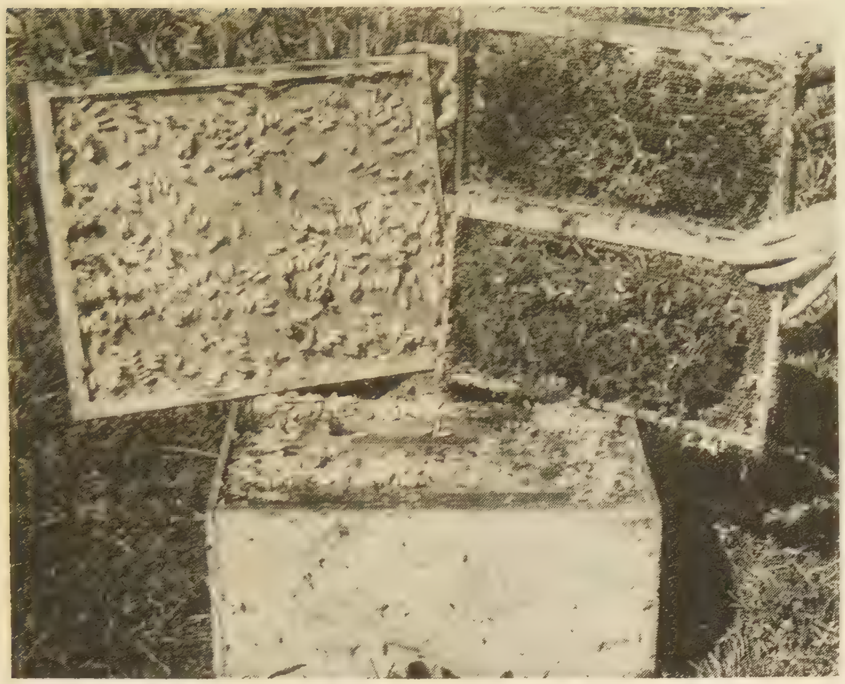


Extensive damage caused by wax moth infestation, showing cocoons and the webbing of the silken tunnels on the bee combs.

hive, a drier site should be sought. Bottom boards which are in contact with the ground or not more than an inch or so above it should be raised by blocks to give at least 6 in. clearance. During winter bottom boards should be given a slope toward the entrance by the backs being raised ½ in. to 1 in. This will allow any water which enters during heavy rain to drain out immediately.

The hives should be cleared of any surrounding growth of grass or weeds so that they will receive the maximum sunshine.

The reduction of hive entrances to not more than ⅜ in. will help to prevent the entry of field mice. Mice can cause much loss during winter through their habits of destroying empty combs and building their nests in the vacant frames.

In districts where the average percentage of relative humidity is high it may be found that hives, though weatherproof and clear of surrounding growth, are still continually moist internally. This can be overcome by providing the hive with some system of top ventilation.

Increased ventilation can be provided by fitting two ½ in. strips of wood across the inside of the hive lid so that the lid does not sit closely on the top edge of the super. The hive mat is cut to provide ½ in. clearance at each end. This arrangement will allow the moisture-laden air to rise up over the mat and escape under the lid, thus preventing undue condensation within the hive.

In the final preparation of hives for wintering a quick glance at the brood for signs of disease is also desirable. All spare supers and bee combs should now be removed from the apiary and stored until required again next season. Surplus bee combs should be stored in a dry place and special care is necessary to protect them against wax moth and mice damage.

Wax Moth Damage

Precautions against wax moth damage should begin this month. Two species of wax moth are established in New Zealand. They are the larger (*Galleria mellonella*) and the lesser (*Achroia grissella*), the larvae of the larger moth causing the greater damage to bee combs.

The larvae of the lesser moth have individual tunnels, and though pupation usually begins in the comb, the damage is not great. However, the larger moth larvae congregate and in this manner whole supers of combs are soon ravaged. These larvae, in search of food, destroy combs by burrowing through the cells, constructing silken tunnels as they go. The larvae feed on the pollen and waste materials found in the cells.

The adult female commonly lays 400 to 800 eggs, generally after dark. These hatch within five or more days, according to temperature, and the larvae become ravenous feeders, reducing unprotected combs to a mass of waste material within a short time. After the feeding period the larvae spin their pupal cases in the comb or migrate to the frames or walls of the hive. There they eat a depression in the wood before spinning their cocoons.

Strong colonies of Italian bees usually do not allow the wax moth to establish in their hives, as they remove the larvae as soon as they are large enough to be dealt with; unfortunately the dark races of bees apparently take the line of least resistance and allow the depredations of these pests to proceed unchecked. Careless beekeeping methods encourage wax moths to breed, and if hives are neglected and become weak or queenless, they are soon invaded by these insects.

Combs in storage are soon destroyed by this moth unless properly protected. Because of the feeding habits of the larvae a good practice is to sort combs into various classes for winter storage. Brood combs should be kept together, combs containing some pollen stored elsewhere, and new combs kept in separate piles. The frames in the super should be spaced widely—not more than eight combs to each super—and a sheet of newspaper placed between each super.

Fumigation

Storage combs can be protected by being placed in an airtight room and fumigated with burning sulphur. Fumes of burning sulphur are effective in killing adults and larvae, but do not kill eggs. For this reason two fumigations about 10 days apart are necessary to kill all stages. It is one of the safest fumigants if precautions are taken to prevent fire.

Where only a few supers of combs are to be stored away during the off season, the crystals of paradichlorbenzene (PDB) may be used. This chemical will repel the wax moths and kill their larvae. The crystals can be placed on the paper over each super of combs as the combs are stacked for storage. A tablespoon for each super will be sufficient if the supers are made airtight.

These combs should be inspected periodically and more crystals added if necessary. The vapour is heavier than air and is not injurious to humans. Provided the crystals are not taken internally, this chemical may be used with safety. The natural, delicate flavour of honey may be impaired if the combs are not thoroughly dry and free of all traces of honey when stored away under fumigation. They should be aired before being used on the hives.

◆

Systems of Pruning Chinese Gooseberries

PRUNING of Chinese gooseberry vines has been the subject of much discussion, and various systems have been advocated, especially in the last 10 years, during which production of this fruit has increased in New Zealand to a quite substantial commercial quantity—about 400 tons in 1959. Some of the pruning systems adopted by Bay of Plenty growers are described in this article, which also discusses the growth and fruiting habits of the vines.

← Vines after several years of neglect, showing an overcrowded mass of canes.

By B. M. PIPER,
Horticultural Instructor,
Department of Agriculture,
Tauranga

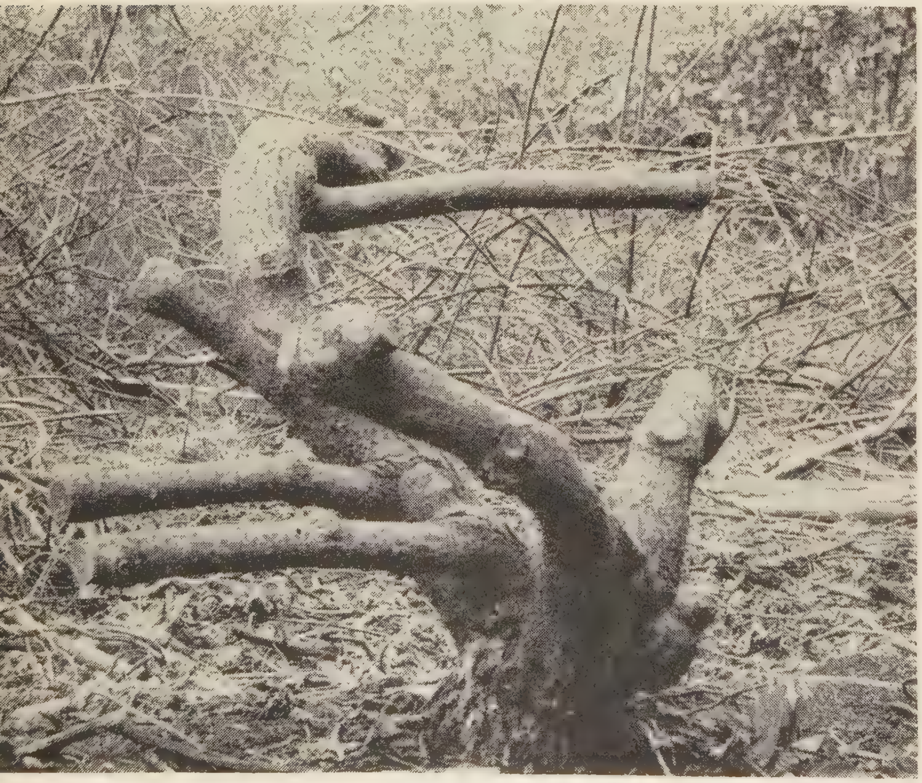
CHINESE gooseberry plants are dioecious, the fruits being produced on plants bearing female flowers which must be fairly close to flowering male plants to ensure pollination and development of fruits.

As with many other plants, including passionfruit and grape, flowers are produced only on new shoots of the current season's growth. The habit of growth of the Chinese gooseberry vine most closely resembles that of the grape and, broadly, the same methods of pruning are applicable.

Flowers come from the first three to six buds on a new shoot and may be single or in clusters of two or three.

Growth habit lends itself to either spur pruning as for most glasshouse and outdoor dessert grapes, or to removal of most of the old wood and laying down of a new set of one-year-old lateral canes each year as with most of the wine grape varieties, or to a combination of both methods.

The problems of control of Chinese gooseberry vines by pruning are associated mainly with the exceptionally vigorous and rapid extensions of many of the lateral growths each season. To restrict spur growth to manageable proportions requires much detailed and frequent pruning, while annual replacement of lateral canes calls for untangling and removal of



← The first step in renovating the neglected vines. Such severe cutting should be completed before the end of July.

a large quantity of older growths each year and some control of the long lateral shoots during the growing season.

The tendency for the majority of the annual shoots on some varieties to twist and twine around wires or other shoots can increase the amount of work because the canes should be kept reasonably free, so that they can be correctly spaced at pruning time. The variety Bruno grows mainly straight canes, and Hayward variety also is not difficult to manage, but Abbott has a pronounced twining habit.

Supports for Vines

Many different types of supporting structures have been used for training the vines, but the main factors must be strength and durability, for the vines are heavy and long living.

There are two basic types of support, each of which has advantages in different circumstances. Overhead pergolas, carrying the fruiting wood 5 ft 6 in. to 6 ft 6 in. above ground, are suitable if spur pruning can be rigidly applied, whereas a pruning system involving retention of long new canes for annual replacement of fruiting wood almost inevitably results in a hopeless tangle of growths above the pergola.

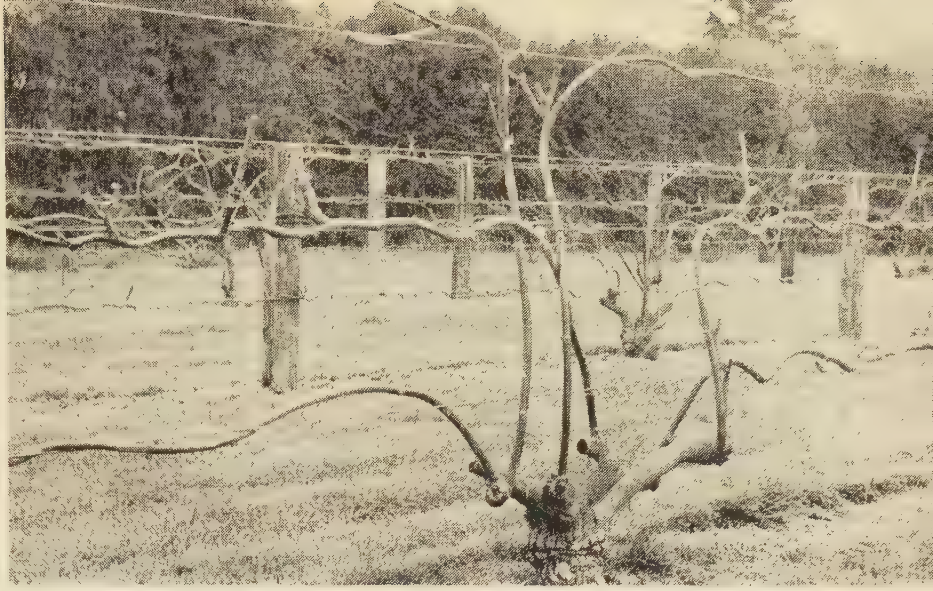
Vertical fences about 6 ft high are suitable for the cane replacement pruning method, and may also be used to support spur pruned vines. The fences usually have two wires, one at the top and one 2 ft lower. Two are sufficient to support the vines on the cane replacement system, and it is inadvisable to have more than four wires for spur pruned vines. More wires would make pruning and removal of old wood more difficult.

Fruiting Habit

Fruit is produced on the current season's growths and is confined to the first three to six buds on those canes or laterals. New canes may arise from almost any point on the vines, but usually only those from the previous season's growth are fruitful. Many of the new canes are extremely vigorous and, if unchecked, may extend as much as 30 ft in a season. The objective of pruning is to keep the vine growth under control while maintaining profitable productivity, and this result can be achieved by one of several pruning systems.

Early Training

It takes three to four years for Chinese gooseberry vines to carry profitable crops. During that period the canes must be trained and tied into their permanent or semi-permanent positions. In the first three years there is little difference in method of training whether the ultimate objective be spur pruning or annual renewal of longer fruiting canes.



A Chinese gooseberry vine trained on a three-wire fence with the spur pruning system one year after hard cutting back.

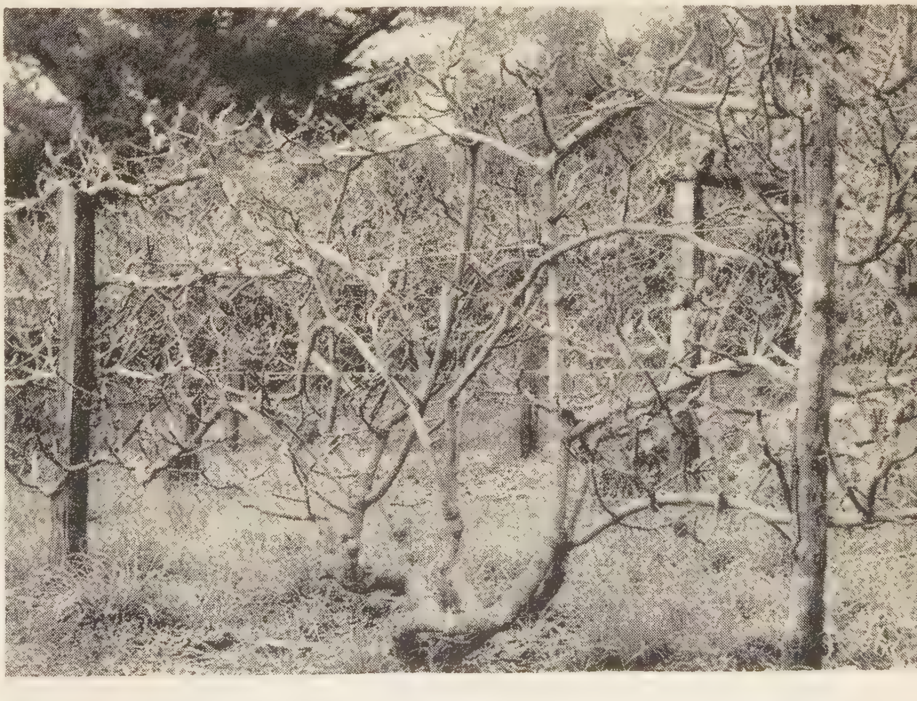
If vines are to be trained on fences, the strongest suitably placed canes should be selected and led up to and along the supporting wires. Growth may be rather slow in the first season, but in three years there should be enough cane growth to furnish each supporting wire with one or two strong canes in each direction.

Vines to be trained on overhead flat-topped pergolas are best confined to single vigorous stems until they approach the top of the structure. The next step is to take one or two main branches lengthwise in each direction along the centres of the pergolas and then, from those principal members, to train lateral growths at right angles outward to the sides of the pergola tops. The laterals should be spaced 24 to 30 in. apart. The number of years required to furnish an overhead pergola fully will depend on the vigour of the vines.

While the main frameworks of the vines are being developed and trained surplus or weak main or lateral growths should be suppressed to prevent overcrowding and to divert the full energy of each plant into production of a strong framework on which future fruiting wood will be carried.

To hold them in position canes should be tied and not twined around

▼ A well managed spur pruned vine after winter pruning on a four-wire fence. There is one arm with well spaced fruiting laterals along each wire.



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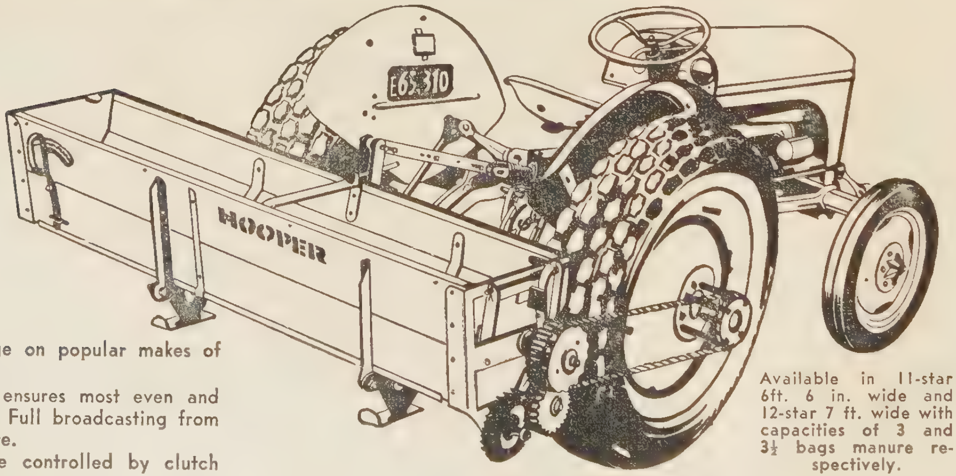

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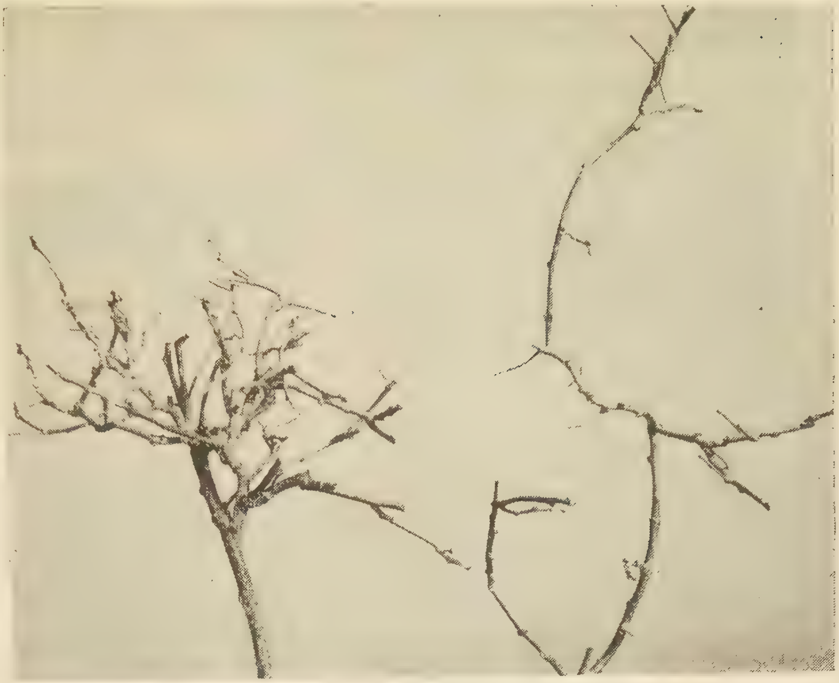
the wire supports, for each twining greatly increases pruning difficulties when replacements become necessary later. Much of the work of training the vines must be done at intervals throughout each growing season to suppress undesirable growths and prevent those selected for the main framework from becoming unduly tangled or twined around supports.

Spur Pruning System

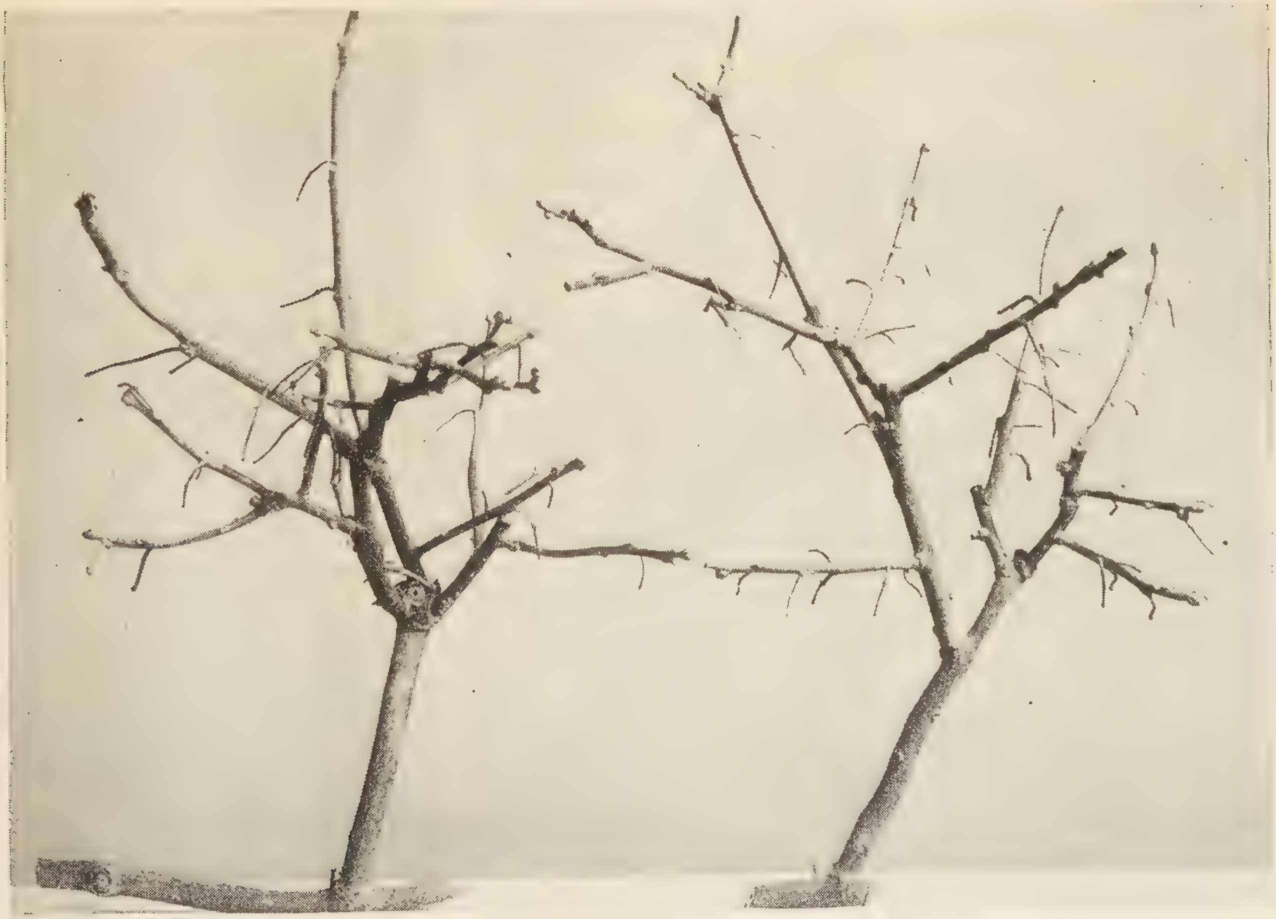
Spur pruning requires much rather tedious work to keep spurs under control and prevent overcrowding and excessive shading. It is the most suitable pruning method for vines trained on overhead pergolas.

Initial cost of pergola supports is greater than for fences and the spur pruning method which is most suitable for pergolas requires more time and labour than does the simpler system of renewal of longer annual fruiting

Old spurs due to be replaced. → Left—A crowded spur that will produce only small, poor fruit. Right—A weak, leggy spur.



↓ Fully developed spurs of desirable types.



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canes. On the other hand, pergola trained vines may be expected to carry much more fruit per acre. The combination of pergola and spur pruning is, therefore, most suited to a grower with only a small area of land. Higher establishment cost and a greater labour requirement are balanced by heavier yields from a comparable land area.

Once the main framework of a vine on a pergola has been established long canes must be suppressed, except those required to extend laterals to the sides of the pergolas or to replace any laterals which may have been damaged or be showing signs of weakness and loss of fruiting capacity.

The accent is on stringent control of spur growth. That means starting early in November and cutting back each spur three to five times during the growing season.

Spurs originate as single shoots from lateral canes. The first cut is made at three or four buds beyond the last fruit. Each subsequent cut leaves one or two buds beyond the preceding cut until late in the growing season, or in winter, when a final cut is made to leave only one or two of the buds which were originally retained beyond the fruit when the first cut of the season was made. That method keeps the spur as short as possible.

In subsequent seasons each spur will produce one or two shoots from the terminal buds left at the final pruning of the previous season, and the treatment is repeated. After three seasons spurs tend to become large, "leggy", and crowded, and to carry smaller and inferior fruits. Such spurs should be cut back to a base bud or shoot which is developed again as a fruiting spur.

To avoid removing all or most of the fruiting spurs in any one season some should be cut back each year from the time the vines are fully established, beginning with some of those which will have been developed before the pergolas were fully furnished with laterals. Old, "leggy" or faulty spurs should be replaced first, but, as far as possible, on well established vines spurs should be cut back on a pattern which will keep distribution of fruiting wood as even as practicable over the whole vine.

New spurs from dormant base buds of discarded ones usually will not fruit in their first season, so it is desirable, when renewing spurs, to cut back to a new shoot if one is available.

All long lateral growths, except odd ones which may be required to replace faulty members of the main frameworks of the vines, should be ruthlessly suppressed; they cause undue shading, wastefully absorb the energies of the plants, and become tangled nuisances which must be removed at winter pruning time.

Generally, summer pruning is devoted to restricting spur growth and suppressing unwanted new lateral canes.

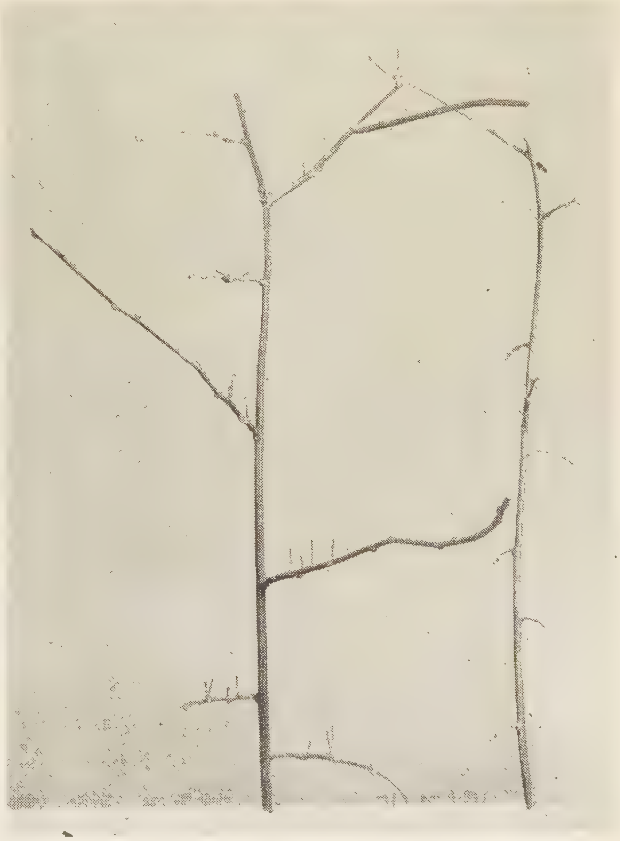
Late winter, with leaves and fruit out of the way, is the best time for thinning out old spurs, removing faulty main members of the vine frameworks, and replacing them with new canes which have been allowed to grow for that purpose. The spurs carry the crop, but it is important that they should not become overcrowded, for if they do, smaller and inferior fruit will inevitably result.

The objective with spur pruning is to suppress unnecessary wood growth and maintain a framework of laterals adequately furnished with healthy spurs but not overcrowded.

Cane Replacement Pruning System

Vines grown on fences, especially in large areas, are usually pruned on a system requiring very much less detailed work and consequently less time. Yields per acre are smaller, but

← Canes that grew and fruited in the past season. Such canes will produce fruiting side laterals in the next season.



Canes similar to those in the opposite illustration, showing second season development of lateral fruiting wood. The growth of the cane on the right was restricted by excessive shading in a crowded position. →

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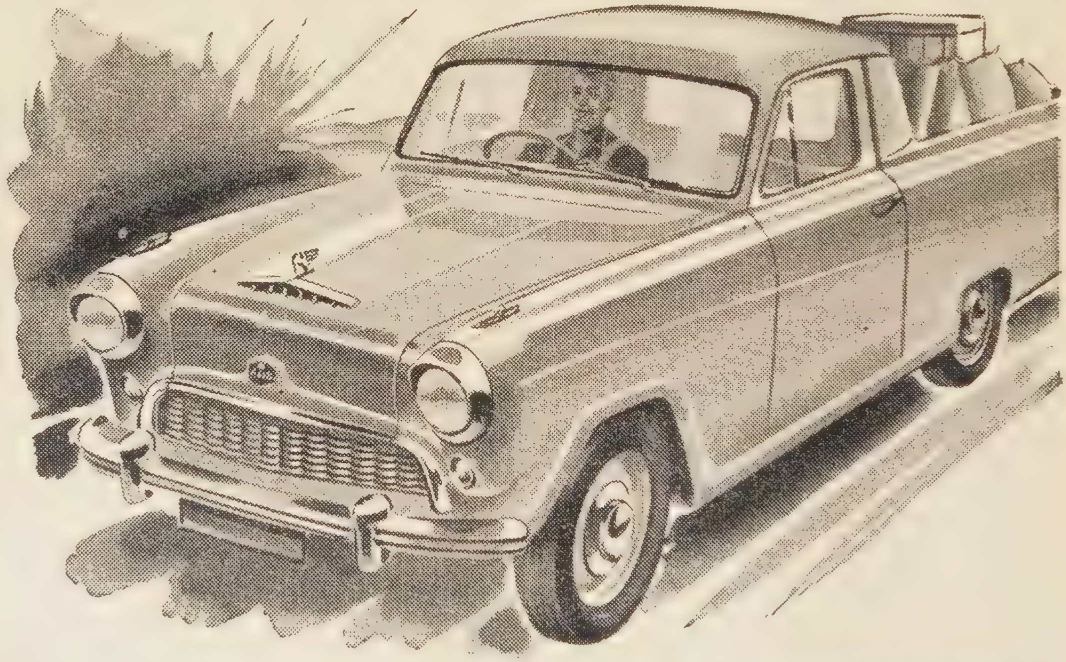

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the labour requirement is greatly reduced and regularity of work is less critical, though it must not be neglected.

Early training of vines on fences is similar to that on pergolas, but because the area to be covered is smaller, the fences are usually fully furnished in three years.

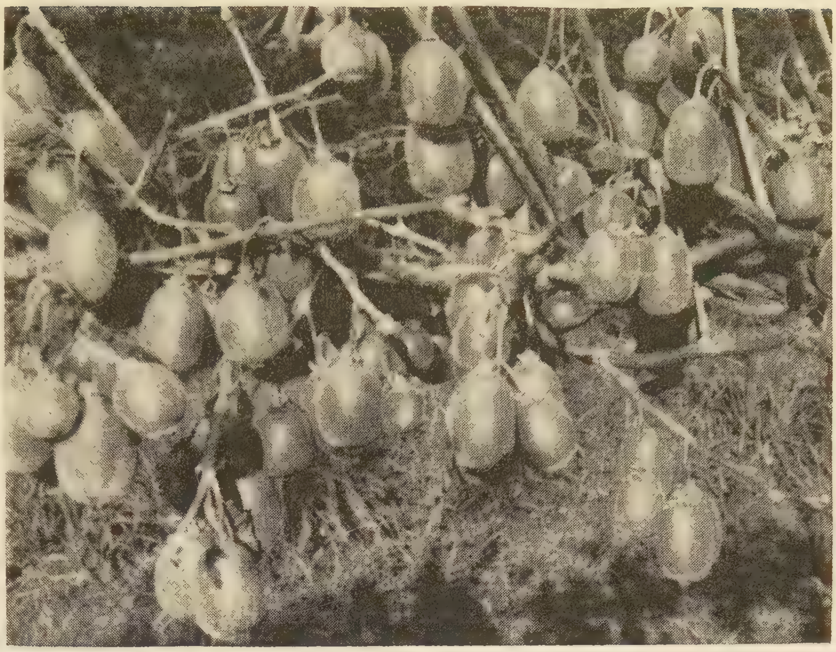
Broadly, the cane replacement pruning system on mature vines comprises removal of as much as possible of the main frameworks of the vines each year and replacement of the older wood with new canes allowed to develop for that purpose in the immediately preceding growing season. Lateral shoots (first year stage for spur pruning) from the new canes carry the fruit. Most of the pruning is done in the dormant season, with summer pruning confined mainly to suppression of unwanted new canes and some shortening of fruit-bearing shoots to prevent overcrowding as well as to keep vine rows reasonably clear of long growths. The summer shortening of laterals amounts to little more than hedge trimming and can be done quickly with a hook or sharp knife.

Winter pruning is a simple matter, but involves cutting out and disposing of considerable quantities of canes which have carried fruiting laterals. The more or less upright main stems are the only permanent parts of the vines. At winter pruning as many as possible of the horizontal canes (trained along the wires at previous winter prunings) as can be replaced by new canes are removed. Canes of the immediately preceding season's growth are then trained along the horizontal wires and will produce the next season's fruiting wood.

Complete replacement of the horizontal canes is seldom, if ever, practicable, for the vines do not often produce enough long canes from, or near to, the main stems to make that possible. Old canes which cannot be entirely replaced should be shortened back to new growths which are long enough to replace the section removed.

If enough canes are available, there can be some overlapping of canes tied horizontally to the fence wires. Generally there should not be more than three or four overlapping fruit canes at any one point along a single wire, but with experience the number may be varied according to the vigour of the vines. Some "bowing" of the canes when they are tied down allows more room for development of fruiting laterals without overcrowding.

Older sections of canes which cannot be replaced need not be unfruitful, for the previous season's growths (which carried the fruit) can be treated as fruiting spurs until the section can be replaced at a subsequent winter pruning. Usually vines on fences pruned mainly on the cane replacement system will carry some spurs where full new canes have not been available, but it is important that spurs should not become overcrowded. Winter pruning time, when the main new canes are being laid down, is the best time to remove "leggy" or overcrowded spurs, but with the replacement system of pruning crowding of spurs is not likely to become a serious problem.



Chinese gooseberries on a spur pruned vine (after the leaves have fallen in early winter).

Renovating Neglected Vines

Vines which are not regularly pruned become tangled masses of old canes and spurs, very much overcrowded, usually producing small inferior fruits and developing a marked "on and off" cropping habit. If such vines are healthy, they can be brought back to manageable proportions and better cropping habits by severe pruning followed by suitable general management.

Chinese gooseberry vines are vigorous and recover quickly from drastic treatment, but yields are low in the next season and usually light in the second season because the vines are diverting most of their energy to producing strong new growth.

When severe pruning is to be done the first action is to take a good look at the vine and decide which, if any, of the main limbs can be entirely removed. Very often two or three saw cuts will remove much unwanted wood and still leave a reasonably well spaced framework of limbs as a basis for the renovated plant. After the main cuts have been made, and the severed wood cleared from the trellis or pergola, the remaining members are given more detailed pruning similar to that done on a regularly pruned vine. It is necessary, sometimes for several years, to compromise between spur pruning and cane replacement to take advantage of any suitably placed fruiting wood which may be available. Some parts of the vines are sure to be sparsely furnished at first because of crowded growth during the period of neglect.

All hard cutting back of vines should be completed by the end of July, well before spring sap movement begins, or serious "bleeding" (loss of sap from fresh cuts) may weaken the vines. Normal, lighter pruning may continue until the end of August.

Saw cuts should be trimmed smooth with a sharp knife, and all large pruning cuts should be protected by a suitable wound dressing, which should be inspected at least once a year and resealed if the surface has become broken or cracked.

The best time to repair fences is immediately after winter pruning, when they are most readily accessible and the vines are lightest in weight.

If fences have collapsed, even more drastic cutting back of vines may be necessary to allow repairs. Provided that the pruning is done not later than July, the vines will not suffer unduly, but there will be temporary loss of crop. Fence maintenance should never be neglected, for it is much better to repair sections as they deteriorate than to wait until the whole structure collapses.

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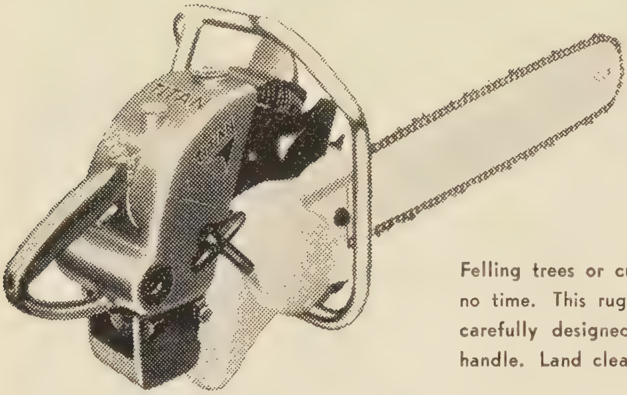

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Prairie Grass on a Marlborough Sheep Farm

DURING the past few years the successful use of prairie grass (*Bromus catharticus*) in general pasture mixtures or as a special-purpose pasture has increased considerably, particularly in dairying districts of the North Island. Though it has been sown periodically in parts of Canterbury and Marlborough for sheep grazing under low rainfall conditions, these sowings have, in the past, generally proved disappointing; consequently, prairie grass came to be considered unsuited to the conditions in lower rainfall areas.

HOWEVER, it now appears that management factors are of paramount importance in determining the success or failure of prairie grass sowings under low rainfall, and this article describes the good results attained with this grass on a Seddon farm under suitable management practices.

Mr F. G. Butt, the owner of the Seddon property, first became interested in the use of prairie grass about nine years ago and was able to harvest a small quantity of seed from plants growing in his orchard. This seed was sown in a 2-acre paddock in 1952, and since then further paddocks have been established. Today, there are about 37 acres of prairie grass pastures on the property.

Description of Property

The property is of 270 acres of flat to easy rolling country, 4 miles from Seddon, in the lower Awatere Valley. Annual rainfall averages 21 in. and summer droughts are common. The soil type is a Sedgemere silt loam, a deep, slow-draining soil occurring extensively on undulating to easy rolling land in the district between Seddon and Ward and in parts of the lower Wairau Valley. The soil contains moderate amounts of phosphate and lime, but responds to treatment with these materials.

The property carries about 900 sheep comprised of 700 crossbred ewes, a Dorset Down stud flock of 100 ewes, and 100 to 150 other sheep.

By W. R. CRAWFORD,
Fields Instructor,
Department of Agriculture,
Blenheim

Pastures are mainly perennial ryegrass and subterranean clover, with some white clover and a little cocksfoot, and 30 acres of lucerne are grown for hay and seed. In favourable seasons seed crops of ryegrass and clovers are saved and, in addition, 30 to 40 acres of garden peas are usually grown for seed.

Method of Sowing

The sowing of prairie grass seed offers some mechanical difficulties, but Mr Butt has found the best method is to sow the seed on its own through the stars of the fertiliser box of a grain drill at 30 to 35 lb of seed per acre. The prairie grass is sown alone because on this property volunteer subterranean clover usually soon comes into the sward to provide a balanced pasture. The best time of sowing has proved to be in late December, even though the soil may then be dry. Sowing into dry soil does not appear to have any adverse affect on germination and successful establishment has been achieved in all sowings made at this period. If, however, clovers are not expected to develop naturally, cowgrass and subterranean clover are included in the seeds mixture.

Utilisation

Mr Butt looks on prairie grass as a permanent type of green feed. A sowing of this grass is relied on to last about six years, and acts as a source of green feed at difficult times of the year, thereby greatly reducing the amount of cultivation required annually.

Prairie grass pastures are particularly valuable during winter. Growth continues quite vigorously locally even in late winter, when frosts of 15 degrees and over are frequent. The growth rate may fall away in spring, but vigour returns in late October-November.

The prairie grass pastures have various uses, but are mainly used as a reserve for ram hoggets and the ewe flocks at various times during the year. The ewes are normally flushed on these pastures in January and grazed on them just before lambing in July. The pastures are also used extensively from mid December onward as lamb fattening feed. In most

HEADING PHOTOGRAPH: Prairie grass seed in half sacks on fences after harvest. A threshed paddock is on the right of the sacks.

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seasons extra lambs are bought in for fattening and grazed on these special pastures.

Heavy hay crops have also been taken, up to 90 bales per acre of good-quality cowgrass and prairie grass hay having been harvested in November. When cowgrass is sown with the prairie grass the best hay cuts are secured in the first two years of the pasture's life. Good aftermath grazing is normally available in January, and extra lambs are often fattened at this time. Under local climatic conditions cowgrass runs out after about two years and subterranean clover then comes into the sward to provide an adequate supply of nitrogen and a good, balanced pasture.

Grazing Management

These special-purpose pastures are never intentionally grazed very hard, grazing being confined to about one to two hours a day, at about 20 sheep per acre, in all instances. This lenient controlled grazing appears to be the critical factor in determining the success of prairie grass on this property. When Mr Butt first started using prairie grass he realised that it would not thrive under close continuous grazing, and adopted the practice of short grazing periods to maintain a good sward.

There is little doubt that this system of management has contributed largely to the life of these pastures. Locally, the failure of many of the past sowings of prairie grass to persist has undoubtedly been due, largely to heavy, unrestricted grazing.

Seed Production

Prairie grass on Mr Butt's property appears to be a very shy seeder and seed harvests have been infrequent. However, in suitable seasons seed crops have been taken from some of the paddocks. Paddocks for seed are closed to stock in early November and are ready to harvest about the end of December or early January.

Two methods of harvesting have been tried. One was to cut the crop with a binder and allow the seed to finish off in the stook before threshing with a header harvester. The other has been to direct head the crop, and Mr Butt considers this method more satisfactory. The seed does not shake readily from the heads and, for this reason, the crop is usually left until dead ripe before harvesting. The most suitable stage for direct heading has proved to be when the heads have drooped over, by which time the seed is fully ripened and easily threshed. Bags are half filled and hung over fence lines before final bagging, but this process may not be necessary in very dry seasons.

The yield from a paddock harvested in this way was 600 lb of machine-dressed seed per acre. Windrowing has not been tried, but the crop should lend itself to windrowing through a binder or windrower, provided there is sufficient bulk of material to be picked up by the header.

Reseeding

Over the years the prairie grass pastures have recovered much better than ryegrass pastures from the frequent summer droughts. The district had one of the worst droughts in its history in 1958-59, and even though the prairie grass pastures were, of necessity, closely grazed, their recovery during the autumn and winter of 1959 was amazing.

50th Jubilee Issue of "Journal", June 1960

THE completion of 50 years of publication of the "Journal" this year is to be marked in the June issue, which will have many special features of historical interest.

The state of farming in 1910, when the "Journal" first appeared, is reviewed, and other articles deal with the development of many aspects of agricultural research and extension and changes in farm management techniques as reported in the "Journal" over the half-century.

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This recovery could be largely attributed to the ability of this grass to reseed, even under such adverse conditions. Though hard grazed during the drought, some of the grass reseeded well, directly from the exposed crowns, and, after a light discing and topdressing with superphosphate in autumn a strong re-establishment was obtained. Surface cultivation of prairie grass and subterranean clover pastures under such conditions has proved most valuable, with the dual effect of promoting the reseeding of prairie grass and rejuvenating the subterranean clover.

Assessment

Under the climatic and soil conditions of the Seddon district and with good management prairie grass pastures have proved a valuable adjunct to stock feeding on Mr Butt's property. The pastures are never intentionally hard grazed and this factor has contributed largely to the length of life of this type of pasture. Prairie grass pastures sown six to seven years ago are still vigorous and capable of high production and, with lenient management, have lasted as long as those in perennial ryegrass.

It would appear from Mr Butt's success with prairie grass that a new light has been thrown on the suitability of this pasture species for dry land conditions. However, those contemplating its use should remember that this grass is very palatable, and is therefore particularly susceptible to overgrazing. If this point is watched and other management practices described are adhered to, farmers sowing prairie grass could be agreeably surprised by the amount of good grazing it provides as a special-purpose pasture under low rainfall conditions.

After several years' experience with prairie grass Mr Butt considers that a suitable area of this type of pasture, under farming conditions similar to his, is about 5 to 10 per cent of the farm. Farmers are recommended to sow only a small area at first to determine its suitability to the district and the best way of managing it.

◆

A. and P. Show Dates

The following are dates and venues of remaining A. and P. autumn shows:

April

18 April—Strath Taieri at Middlemarch.
*18 April—Mackenzie County at Fairlie.

◆

Winter Show Dates

10, 11, 12, 13, and 14 May—Southland at Invercargill.

*2, 3, 4, 6, and 7 June—Otago at Dunedin.

*31 May, 1, 2, 3, 4, 6, and 7 June— Waikato at Hamilton.

9, 10, and 11 June—Te Kuiti and District at Te Kuiti.

*15, 16, 17, and 18 June—Taranaki at New Plymouth.

21, 22, 23, 24, and 25 June—Whangarei at Whangarei.

25, 26, 27, and 28 August—Whakatane at Whakatane.

* The Department of Agriculture exhibit will be staged at this show.

◆

Wool Sales

Dates and venues of wool sales up to the end of May are:

23 April: Christchurch.
28 April: Dunedin.
2 and 4 May: Invercargill.
13 May: Wanganui.
18 May: Napier.
23 and 25 May: Auckland.
30 May: Wellington.

◆

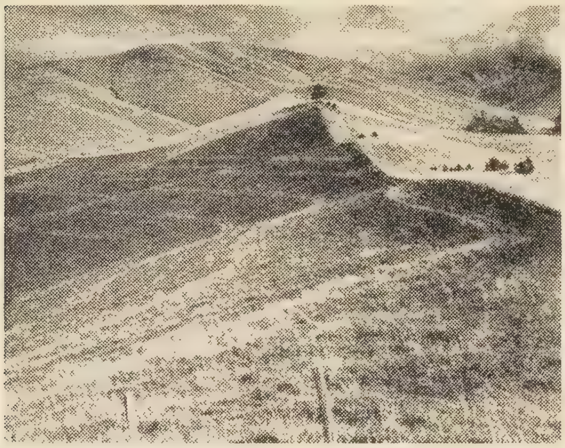
PATTERN FOR PRODUCTION. No. 2 of a series.

PRODUCTIVITY RE-ESTABLISHED

"In nature there are no rewards and no punishments—just consequences."

THE "CONSEQUENCES" ARE SOIL EROSION AND FLOODING

Soil erosion strikes at prosperity. In New Zealand today there are some twenty seven million acres on which erosion is affecting production!

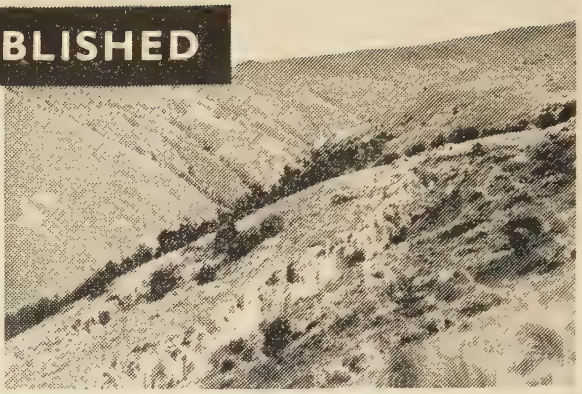


TO MEET EVERY CONSERVATION REQUIREMENT THERE IS A PROVEN PROGRAMME AVAILABLE!

Pioneer investigations by catchment boards and Government Departments have resulted in the development of many conservation methods. Advice is free–and subsidy is available for erosion control. Upon application to a catchment board or the Department of Agriculture a farmer can have the land capability of his property assessed and a conservation farming programme prepared and geared to his own resources for a five-year period.

SOIL
CONSERVATION
OFFERS
PLANNED
ECONOMY

THE SOIL CONSERVATION AND RIVERS CONTROL COUNCIL



CONSERVATION FARMING RESULTS IN SPECTACULAR DEVELOPMENT

Drastic changes in vegetation brought about by farming, have been reflected in equally drastic changes in the soil on our hill country.

Experimental work, such as that carried out on Wither Hills Soil Conservation Reserve, Blenheim, has resulted in simple, practical and inexpensive answers to these erosion problems. Land which, only a short time ago was unproductive, can be brought back, step by simple step, into full profit.

THE METHOD? Pasture improvement, grazing control, contouring, tree planting, gully control and fire and pest control.

NO PASTURE NEEDS TO BE UNPRODUCTIVE!

BULLETINS AVAILABLE

"Conservation Farming for Hill Country"	No. 15
"Giving Wings to Soil Conservation"	No. 11
"Conserving Soil and Water Resources"	No. 16

Post this coupon for free bulletins and advice.

TO: The Soil Conservation & Rivers Control Council,
P.O. Box 8024,
WELLINGTON.

Please forward, free of charge, the following Conservation Bulletins.
(Nos.) ____________________
Name ____________________
Address ____________________

Would you like a field officer to call and discuss your conservation problems YES/NO

Simple Method of Holding Bee Supers during Painting

By C. R. PATERSON,
Apiculturist,
Department of Agriculture,
Hamilton

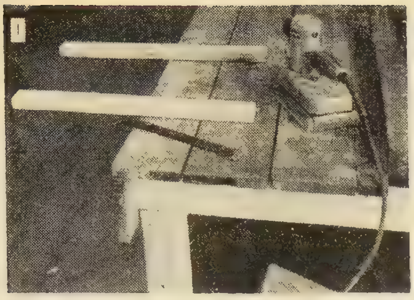
As timber treated with some of the usual timber processes is toxic to bees, beekeepers rely for maximum protection and preservation of hive bodies and supers on paint and its proper application.

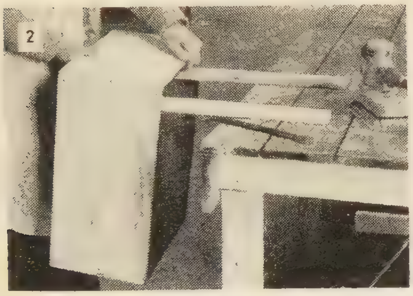
Many methods for the quick painting of supers have been devised, but it seems impossible to get away from the sound practice of treating and painting each super individually. Painting can become a messy job, as so many parts of the super require painting. Each year the beekeeper will always have a few new supers to paint thoroughly in addition to the normal repainting of working supers, as deterioration of these is rapid unless they are adequately protected against weather.

Choice of Paint

A good paint should always be used. A slightly different shade can be used each year as a means of telling how long supers have been painted and as a way of checking up on the wearing qualities of different brands of paint.

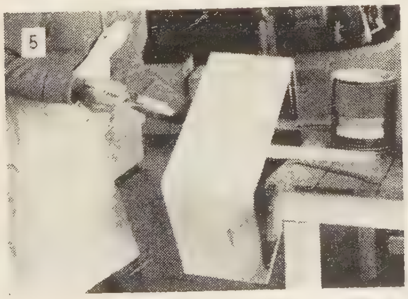
A. W. Bennett, Apiary Instructor, Department of Agriculture, Hamilton, in the accompanying photographs, shows how this work can be carried out most effectively and with the minimum of inconvenience.



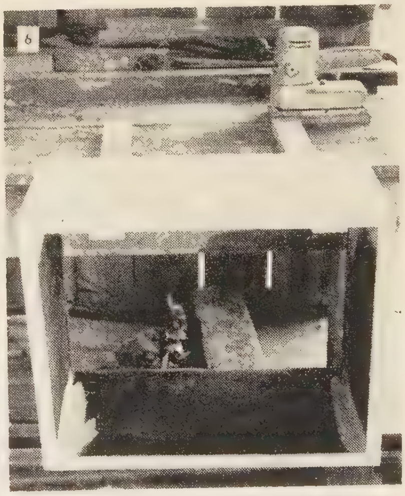


1 and 2—Securely fix two lengths of timber to the work bench or similar object. They need not project more than about 9 in. and should be spaced so that the outside edges are about 13 to 14 in. apart. The two arms make a good support for the super on its side or end. The arrangement allows the beekeeper to renovate a super in a fixed position and at a height at which painting is not too fatiguing. It also allows the operator to turn the super round easily with one hand so that the paint brush can still be held in the other.

3—Paint adheres best to a good clean surface, so that when old supers are being repainted a good sandpapering is well worth while. The orbital sander, if available, can be used for this job.



4 and 5—It is best to paint the bottom edge of a super before placing it on the wooden supports with the painted edge next to the bench. The four sides, the top edge, and the inside corners can now be done. It is simple to turn the super over with one hand each time a side is painted.



6—The greatest amount of deterioration in a super is at the corners and on the bottom edge. Deterioration round the corners is very much reduced where the ends are painted before assembly of the super. Therefore when painting the supers make sure the bottom edge and even $\frac{1}{2}$ in. up on the inside is carefully done, not forgetting to run the brush down the inside corner.

A Safer Feeding-out Trailer

By J. L. DOUTRE,
Machinery Instructor, Department of Agriculture, Auckland

FEEDING out silage during winter is usually a disagreeable job, requiring a driver and someone to fork off in the field. The farmer working alone is in danger of injury or death when he attempts to alight from a moving tractor to a following trailer or back again. Quick action is necessary if the farmer has to change direction or stop the tractor to avoid a fence or a drain. Muddy gumboots and wet conditions cause dangerous slips on the steel framework. The farmer sometimes attempts to drive the tractor from the trailer by using the fork. If he over-balances or slips he is likely to fall in front of the trailer and be crushed.

MR A. COUBROUGH, Tirau, has designed a safer dual purpose feeding-off tray to fit on to the three-point linkage of his tractor. Like other tray assemblies, it is operated by the hydraulic lift. For heavy silage loads it is lowered to the ground where it runs on two wide 9 in. rollers. This has the advantage of providing extra safety in going up steep slopes with a heavy load by preventing backward upsets.

Alternatively the weight can be transferred to the tractor by use of the hydraulics to give better traction. While the rollers are in contact with the ground the tractor is guided in a fairly straight line. This is an advantage while feeding out, because it allows the farmer complete freedom from steering once he has set the tractor on course.

The flat rollers are not bevelled; this farmer attempted to use swivel turning wheels, as found on a baler, but they were not successful, and were actually dangerous, as they gave the tractor no stability on a straight course.

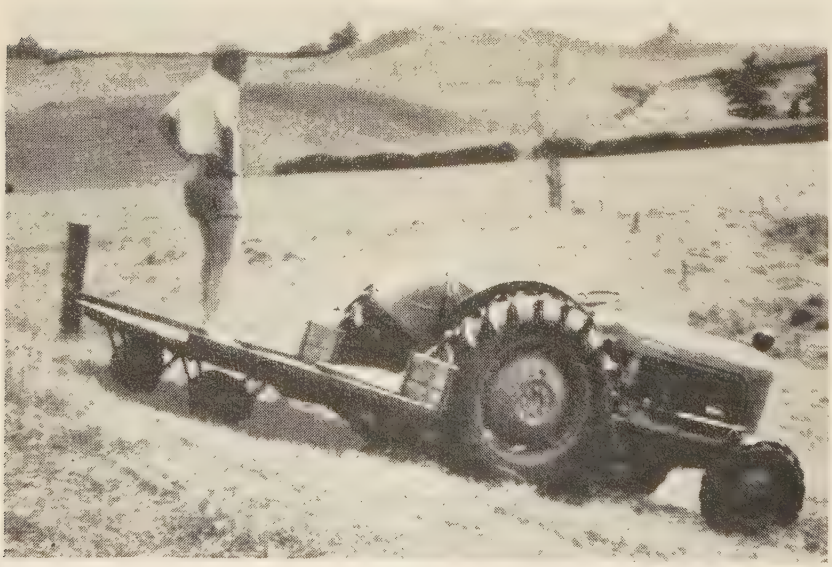
Other Advantages

On steep hillsides the tractor showed no tendency to turn sharply down hill. The tray is low to the ground and makes a very stable platform to work from. Little danger exists should the farmer slip or fall from this height. The tray fits closely to the tractor and there is no chance of the farmer falling between the tractor and trailer.

Because of the added weight of the trailer on the tractor there is little if any wheel slip. There is little side slipping on the paddock through traction being applied to the tractor wheels. In climbing up hill, there is little tendency of a backward somersault as would be experienced with such a load being applied at a higher position on the tractor. In fact the system is maintained in a constant balance, with the hydraulics allowing only a little weight on the front wheels to give steering.

Though this system is not as safe for feeding out as when a driver is available, the farmer is within easy reach of the steering wheel and all the controls. It takes but a moment to move into the seat and take full control of the tractor to turn or to stop.

This type of tray costs considerably less than the conventional trailer, yet has many more advantages, being much more versatile for different kinds of work. The tray being hydraulically controlled, many back-breaking jobs on the farm can be overcome by use of the tractor's power. Loads can be rapidly transferred to different elevations without much lifting being necessary.



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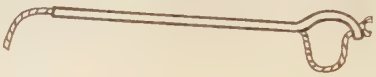
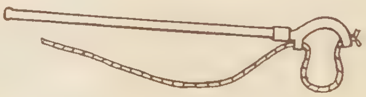
Holding Stick for Restraining Dogs





A HOLDING stick is most useful for restraining a dog where it is difficult or dangerous to use the hands. The stick can be made by passing strong cord through two holes in a piece of ½ in. pipe about 4 ft long (upper diagram). The loop so formed can be dropped over the dog's neck and drawn tight from the end of the stick in the hand. Commercially manufactured "dog catchers" (lower diagram) as used in the United Kingdom can be ordered from firms handling farming equipment.

—*A. D. M. G. LAING,*
formerly Chief Advisory Officer (Hydatid Control), Department of Agriculture, Wellington

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Hay Box Chicken Brooder

By J. H. WARWICK,
Poultry Instructor,
Department of Agriculture,
Timaru

GROWING stock on a Mid Canterbury farm is "hardened off" by transferring the chickens at three and a half weeks from the brooder house to hay box brooders, where they are confined until they are about eight weeks old.

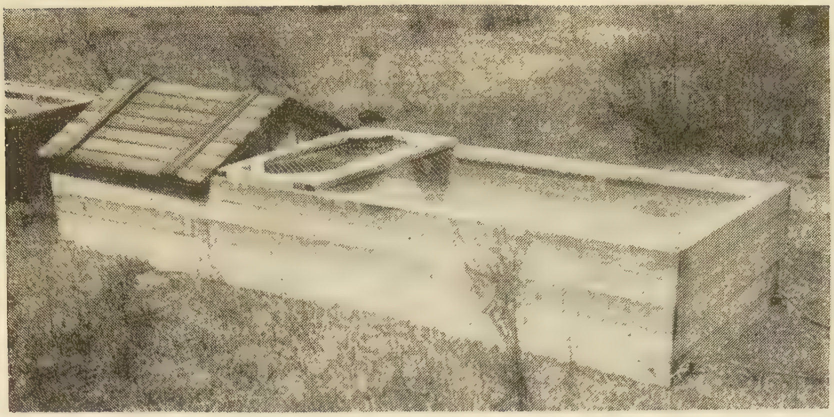
THESE rearing folds are designed to hold about 40 chickens without artificial heat, but a minimum of 30 is needed to generate enough heat to make use of the fold practicable.

The hay box rearing fold is used extensively in the United Kingdom and was designed to produce not only a satisfactory eight-week-old chicken, but also a well hardened off pullet.

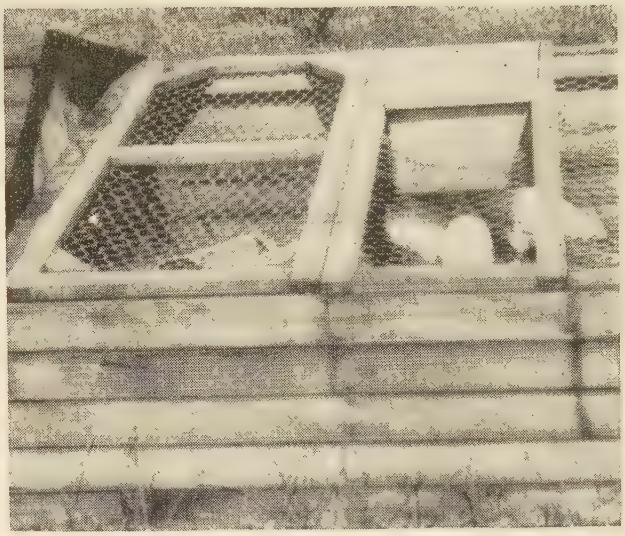
The main advantage of this rearing system is that each batch of chickens is completely isolated and this reduces to a minimum the risk of the birds' catching and spreading coccidiosis and other diseases common to rearing stock. The brooder is very easy to move, and this means that the chickens can be placed on fresh ground every day and that the poultry manure can be evenly distributed over the ground. Though controlled, the chickens have freedom over clean herbage and access to shade. When chickens are transferred from a brooder house to a rearing paddock they often suffer a setback, but use of this type of brooder helps to overcome this.

Layout and Construction

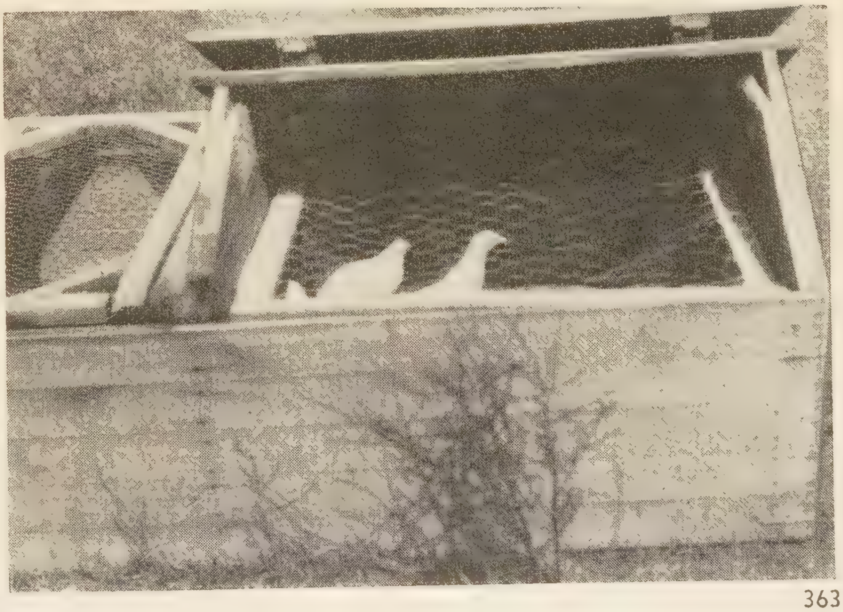
The hay box rearing fold consists of a sleeping compartment and an attached run. The food is placed in troughs either fixed on the walls of the run or in troughs on the ground. The water is also in the run in a fount or in a metal container suspended from the roof of the run, with a drinking nipple fixed in the bottom of the container.



▲ A minimum of 30 chickens is needed to generate enough heat to make use of the hay box brooder practicable.



The nipple → drinker with fowls clustered beneath.



▼ The platform under the lid to hold the hay bag.

Measurements

Material costs about £5. The run and sleeping compartment are made of ½ in. tongued and grooved weatherboard throughout on a framework of 2 x 1 in. timber. The sleeping compartment measures 3 ft 4 in. x 3 ft 4 in. x 1 ft 3½ in. high to the eaves and 2 ft 6 in. to the ridge. The run measurements are 6 ft 6 in. x 3 ft 4 in. x 1 ft 3½ in., and the run is covered with 1 in. wire mesh.

Inside the sleeping compartment are two wire-mesh frames: one, of ¼ in. mesh, is raised off the ground as a floor for the chickens to brood on, and the second, of 2 in. mesh, with a piece of hessian covering it on top, is fixed to a frame of 2 x ¾ in. timber above the chickens to support a bag containing 2 to 3 in. of hay. The hay bag conserves the warmth generated by the chickens. The frame to support the bag is the same size as the floor frame.

Resting on the floor wire and supporting the hay bag wire frame is a circlet of hardboard. This extends and finishes at the pophole leading into the run, its main purpose being to prevent the chickens from crowding into the corners and suffocating.

For access to the chickens inside the brooders one half of the roof is hinged, so that it is comparatively easy to catch the chickens. A second door can be fitted into the roof of the run. These brooders would be invaluable for keeping batches of chickens ready for customers.

Water Supply

The drinking container with the drinking nipple fits into the top of the run. To fix this container a piece of timber 3 ft 4 in. x 2 in. x 1 in. is nailed across the top of the run 10¾ in. from the batten which supports the run lid. A hole cut into the wire netting between the two pieces of wood allows the tank to be dropped through and be supported by flanges on top of the tank. The drinking nipple at the bottom of the tank when pecked allows a small drop of water to appear at the bottom of the valve, and as the beak is removed the valve closes and stops the water. The tank, of 22-gauge galvanised iron, is 9½ x 10½ x 7½ in. deep.

Detailed plans of this type of brooder can be had from the Poultry Instructor, Department of Agriculture, Box 516, Timaru.

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North Taranaki Farm School

SOME of New Zealand's leading agricultural authorities will be taking part in a farm school at Waitara on 3 and 4 May. The school has been organised by the North Taranaki Province of Federated Farmers and the Department of Agriculture.

Speakers will cover a wide range of topics dealing with farm management, animal husbandry, and animal health.

Among the 17 speakers will be Mr A. C. Burgess, acting Fields Superintendent in the Department of Agriculture for the southern half of the North Island; Mr R. H. Scott, Chief Advisory Officer (Farm Economics), Department of Agriculture; Dr S. Jamieson, Chief Advisory Officer (Infectious Diseases Control), Department of Agriculture; Professor I. Campbell, head of the Dairy Department of Massey Agricultural College; Mr J. S. Stronge, vice-president of the New Zealand Farm Forestry Association; Mr F. W. Maslin, Commissioner of Crown Lands at New Plymouth; and Mr E. D. Andrews, Senior Principal Scientific Officer, Wallaceville Animal Research Station.

Fruit Crop Estimates for 1959-60 Season

THE following estimates made in February of the fruit crop for the 1959-60 season are in 000's of bushel cases. They are summarised from information supplied by field officers of the Horticulture Division of the Department of Agriculture. Districts producing less than 500 bushels of a variety are not shown, but are included in totals. District totals of more than 500 are rounded to the nearest 1,000. The berry fruit estimates are in tons .

FRUIT	DISTRICT								
	Auckland Province except Gisborne	Gisborne	Hawke's Bay	Wellington and Taranaki Provinces	Nelson Province	Marlborough	Canterbury and North Otago	Central Otago	Total 000 bushels
APPLES—				000's of bushel cases					
Ballarat	74	4	85	3	7	8	14	1	196
Cox's Orange Pippin	11	3	93	4	144	13	21	8	297
Delicious	25	10	180	7	254	34	33	51	594
Dougherty	20	4	70	—	40	2	—	—	136
Granny Smith	143	8	185	7	146	5	3	6	503
Gravenstein	26	—	30	—	75	1	2	2	136
Jonathan	9	—	60	2	308	35	21	32	467
Sturmer Pippin	8	6	240	18	466	35	71	39	883
Others	131	8	265	9	225	22	55	50	765
Total	447	43	1,208	50	1,665	155	220	189	3,977
PEARS—									
Beurre Bosc	1	—	4	—	8	—	—	—	13
Louise Bonne Jersey	1	—	26	—	1	—	—	1	29
Packham's Triumph	7	—	13	—	13	—	1	—	34
P. Barry	5	1	20	1	7	—	2	—	36
W. Bon Chretien	14	1	95	1	57	1	8	14	191
Winter Cole	1	1	70	3	46	1	8	6	136
Winter Nelis	—	1	58	—	10	—	2	10	81
Others	13	—	10	1	16	1	9	6	56
Total	42	4	296	6	158	3	30	37	576
OTHER FRUITS—									
Peaches	123	20	425	2	59	7	9	119	764
Apricots	2	2	6	—	—	—	24	172	206
Nectarines	2	2	16	—	—	—	1	30	51
Plums	73	3	52	1	9	2	13	30	183
Cherries	—	—	1	—	1	3	1	10	16
Quinces	9	—	7	—	—	—	—	—	16
Total	209	27	507	3	69	12	48	361	1,236
BERRY FRUITS—				Total in tons					
Boysenberries	5	3	15	5	8	—	4	5	45
Currants, Black	—	—	1	24	4	—	56	—	85
Currants, Red	—	—	—	—	—	—	—	—	—
Gooseberries	—	—	2	135	3	—	12	—	152
Raspberries	5	1	25	125	283	2	351	41	833
Loganberries	1	3	1	10	—	—	10	—	25
Strawberries	440	12	15	59	7	1	102	84	720
Total	451	19	59	358	305	3	535	130	1,860

[*Sparrow*

Trees for All

By J. S. SAY,

Horticulturist, Department of Agriculture, Auckland

Trees that were on the original estate were retained when this area was subdivided, and others were planted by the roadside. The park-like effect is enhanced by the absence of fences and footpaths. (Lammermoor Drive, St Heliers, Auckland.)

NEW ZEALANDERS as a whole, say critics, are not a nation of tree lovers, a legacy it is suggested from the pioneer settlers who had to carve their farms out of the bush. No doubt there is some justification for this accusation, for examples are not hard to find. Building sites and housing development areas are often completely denuded of trees, mutilated trees abound in home gardens and in the streets, and there are many miles of roads where the only "trees" are gaunt power and telegraph poles. Street trees in particular have been the target of a great deal of criticism, often justifiable, because the selections made by early planters have since proved unfortunate owing to rapid development of services undreamed of 60 or 70 years ago. On the other hand, their appreciation of the value and beauty of trees is now evident in drives and plantations which provide gracious settings for many country homesteads.

THE comments and recommendations made in this article, though they apply particularly to urban planting, should be useful to country people in the selection, planting, and care of trees for drives, avenues, and ornamental plantations. They should also be of use in many small country towns and settlements in rapidly developing districts. Shops, parking areas, and community centres seem always in the minds of planners, but rarely is thought given to space for trees. Trees in the streets and shopping areas and about community centres would go a long way toward ensuring that these towns develop charm and character as they grow.

Recently there has been a growing awareness that trees are beautiful in

Selection of Deciduous, Semi-deciduous, and

The following is a list of trees useful for street planting. It should not be taken as a general recommendation suitable for all streets. Approximate heights when mature are given. E—Evergreen. D—Deciduous. S-d—Semi-deciduous.

Small to Medium Sized

Acacia baileyana (E) : 20-25 ft. Golden flowers in winter, good grey foliage throughout year. Will stand severe pruning after flowering. Must be securely staked. Not long lived. Other acacias worth considering are *A. longifolia, A. podalyriaefolia, A. pravissima,* and *A. pycnantha.* Suitable for warmer districts or where frosts are not severe.

Acer palmatum, Japanese maple (D) : 20 ft. Good autumn colour. Not suitable for warmer districts or in streets exposed to strong winds.

Agonis flexuosa, Australian willow myrtle (E) : 20-25 ft. Quick growing, stands dry conditions, young growths pink, fairly upright growth, but branches have weeping habit, small white flowers in spring. Not suitable for very windy positions.

Agonis juniperina (E) : 20 ft. Quick growing. White flowers in winter and small leaves, both resembling manuka.

Alectryon excelsum, titoki (E) : 25 ft. Good foliage, half hardy.

Amelanchier canadensis, service berry (D) : 10 ft. White flowers in spring, good autumn colour. Not suitable for warm districts.

Callistemon salignus, white bottle brush (E) : 15 ft. Young growths pink. Other suitable species are *C. citrinus* 10 ft, and *Callistemon linearis* 10-15 ft.

Cercis siliquastrum (D) : 20-25ft. Masses of mauve, pea shaped flowers on bare branches in spring before leaves appear. Good foliage. Also *C. chinensis.*

Cocos yatay (E) : 15 ft. A palm with arching grey-green pinnate leaves. Warm districts only.

Cotoneaster frigida (E) : 15 ft. Clusters of red berries in autumn and winter which may attract children.

Eucalyptus ficifolia, crimson gum (E) : 25 ft. Bright red flowers in summer. Seed capsules and twigs sometimes a nuisance. Frost tender in young stages. As they are grown from seed, colour of flowers may vary from very pale pinks to dark reds. Needs to be staked securely. Other species which could be used are *E. cinerea, lehmanni, stricklandi.*

Eugenia myrtifolia, Australian rose apple (E) : 25 ft. Leaves small, shining bronze when young. Creamy white flowers, purple berries. Tender.

Euonymus europaeus, spindle berry (D) : 15 ft. Good autumn foliage, bright orange seeds in red capsules. Not suitable for warm districts. Hardy.

Euonymus japonicus variegatus (E) : 15-20 ft. Green and gold variegated leaves. Hardy.

Forsythia intermedia spectabilis (D) : 10 ft. Masses of golden bells in early spring. Not suitable for warm districts.

Idesia polycarpa (D) 15-25 ft. Bunches of bright red berries in autumn which remain on the tree until the following spring. Berries only on female trees. One male tree to five or six females should be planted. Leaves large. Grows very quickly.

Koelreuteria paniculata (D) : 15 ft. Yellow-green leaves which turn gold in autumn. Hardy, but not suitable for windy situations. Better in colder districts.

Malus eleyi, crab apple (D) : 20 ft. Copper foliage, purplish flowers, dark red-purple fruit.

Pittosporum eugenioides, tarata (E) : 12-15 ft. Good foliage. Variegated variety with creamy white margins. Half hardy.

Pittosporum tenuifolium, kohuhu (E) : 12-15 ft. Small pale green leaves. There are several varieties with coloured or variegated leaves which do not normally grow so tall.

**Prunus mume,* flowering apricot (D) : 10-15 ft. Double rose-pink flowers in early spring.

**Prunus persica* Clara Meyer, flowering peach (D) : 15 ft. Double pink flowers in early spring.

**Prunus moseri,* flowering plum (D) : 15 ft. Pale pink flowers, bronze foliage.

**Prunus campanulata,* flowering cherry (D) : 12-15 ft. Upright habit with bright red bell-shaped flowers in early spring.

* In general *Prunus* species have a short flowering period and are not particularly attractive for the rest of the year. The cherries with large flowers usually have a much shorter period, especially in warmer districts, where early leaf growth tends to hide the flowers. Most *Prunus* species are liable to severe attacks of pear slug which makes foliage unsightly. Some cherries have good autumn colour in cold districts. *Prunus* species, especially the large flowered cherries, should not be planted without a good deal of thought.

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themselves and can make the approach to and the surroundings of a homestead or a street or suburb less stark. They make living more comfortable, for they provide welcome shade and reduce the glare in summer, deaden traffic noises on busy streets, and give more privacy.

Encouraging Planting

New interest in street trees has been encouraged by a number of local bodies in Auckland by the introduction of "do it yourself" planting schemes. Though these differed in some respects, they had much in common.

Householders in streets or parts of streets met and decided if trees were wanted and the kind of tree. Some local bodies provided a list of suitable trees from which a choice could be made. Others gave or withheld consent to the planting of the chosen variety after the type of street, traffic, soil, underground and overhead utilities, and the many other points which influence the choice of street trees had been considered. The trees and sometimes stakes and good soil were supplied by the local body. The residents shared the cost of the trees, which they planted and staked.

This is a scheme which could well be adopted in many centres, for not only does it improve the appearance of the streets, but, more important, gives residents a personal interest in the trees. The interest of children was also captured and damage by vandalism or thoughtlessness is likely to be less.

Such schemes have pitfalls and cannot be regarded as the perfect solution to getting trees planted. Unless the local body keeps a close watch on the varieties selected large numbers of unsuitable trees might be planted. The local body or its representative must therefore have an intimate knowledge of its streets and the conditions in them and of trees and shrubs. It must also arrange for adequate supplies of suitably grown trees, which cannot be done at short notice.

Experience has shown that in the first year of these schemes there was little difficulty in getting trees planted, but in the second and subsequent years good advertising and organisation are necessary to encourage interest in streets where householders are less enthusiastic.

Though "do it yourself" schemes can relieve pressure on local body staffs in some ways, they can put undue strain on them in others. The delivery of a large number of trees on a Saturday morning can tax delivery facilities, especially if planting has to be concentrated on one day because of postponements owing to a succession of wet weekends.

Evergreen Trees Suitable for Planting in Streets

Requiring Plenty of Room

The following trees make good street trees, but because of their height and spread can be planted only in selected streets where they have plenty of room to develop.

Acer campestre, English maple (D) : 40 ft. Good autumn colour. Not suitable for warm districts.

Acer negundo and variety *A. variegatum* (D) : 30-40 ft. Good foliage, best in sheltered position.

Acer sacchainrum, sugar maple (D) : 30-40 ft. Good autumn colour. Cold districts only.

Aesculus carnea, red horse chestnut (D) : 30 ft. Flowers in spring. Not suitable for very warm districts. Nuts can be a nuisance. Leaves tend to get wind-burnt on edges.

Aesculus hippocastanum, horse chestnut: 50 ft.

Ailanthus glandulosa, tree of heaven (D) : 40-50 ft. Good autumn colour in colder areas.

Betula alba, silver birch (D) : 30-40 ft. A very graceful tree. Light open foliage which colours well in colder districts, silver trunk. Suitable for all districts. Shape easily spoilt by pruning.

Betula papyrifera: Similar to and often considered better than *B. alba*.

Carpinus betulus, hornbeam (D) : 40 ft. Good autumn colour. Cold districts only.

Catalpa bignonioides, Indian bean tree (D) : 30 ft. Large leaves, purple foxglove-like flowers. Sheltered position. Leaves can be a nuisance.

Cinnamomum camphora, camphor laurel (E) : 30 ft. Shining foliage, young growth pink. Warmer districts only.

Corynocarpus laevigata, karaka (E) : 30-40 ft. Half hardy. Good for coastal districts.

Eugenia smithi (*Acmena floribunda*) (E) : 30 ft. Very attractive tree with white or mauve berries in late autumn or winter, and usually suffers damage because of them. Warmer districts only.

Fagus sylvatica, English beech (D) : 50 ft. Colours well in autumn and cold districts. Variety *F. purpurea* (copper beech) grows about 30 ft.

Fraxinus excelsior, ash (D) : 40 ft. Good autumn colour in colder districts. Varieties with golden and purple foliage are also good.

Ginkgo biloba, maiden hair tree (D) : 50-60 ft. Good autumn colour even in warmer districts.

Grevillea robusta, silk oak (S-d) : 30-40 ft. Deeply cut leaves of a good dark green with a lighter reverse. Orange flowers on old trees. Half hardy, but tender when young.

Jacaranda ovalifolia (S-d) : 30 ft. Fine acacia-like foliage and blue flowers in summer. Very warm districts only.

Liquidambar styraciflua (D) : 30-40 ft. Brilliant autumn colour, especially in cold districts. Also several other species with similar characteristics.

Melia azedarach (D) : 30 ft. Spreading tree with good foliage. Panicles of lilac flowers in spring. Small yellow berries in autumn and winter.

Metrosideros tomentosa, pohutukawa (E) : 30-50 ft. Half hardy and needs protection from frost when young.

Metrosideros villosa, Kermadec pohutukawa (E) : 20-40 ft. More compact habit than the ordinary pohutukawa. Long flowering season, but rarely makes a brilliant show. Half hardy.

Platanus acerifolia, London plane (D) : 40-50 ft with an equal spread. A beautiful tree when allowed to grow naturally.

Quercus cerris, Turkey oak (D) : 50 ft. Good autumn colour. More suitable for colder, coastal districts.

Quercus coccinea, scarlet oak (D) : 30 ft. Brilliant autumn foliage. More suited to colder areas.

Quercus palustris, pin oak (D) : 40 ft. Good autumn foliage, better in colder districts.

Quercus pedunculata, English oak (D) : 40-50 ft. Not suitable for warmer districts.

Schinus molle, pepper tree (E) : 30 ft. Spreading tree with graceful foliage. Warm districts only.

Sterculia acerifolia, flame tree (S-d) : 50 ft. Masses of scarlet bell-shaped flowers in summer. Very warm areas only.

Sophora tetraptera, kowhai (S-d) : 20-30 ft. Growth often slow when young. When flowering stage is reached makes a wonderful show for a short period, but the tree itself is often not particularly attractive.

Tilia cordata, lime or linden (D) : 50 ft. A beautiful spreading tree. Sometimes severely attacked by aphids.

Vitex lucens, puriri (E) : 30-40 ft. Spreading branches, good dark green foliage. Pink flowers and red berries are attractive, but can be a nuisance on paths.

One of the biggest causes of failures is the actual planting of the trees. If possible, someone with a knowledge of planting, staking, and tying should be present in each street to give advice to novices. Adequate preparation of the planting sites, which will be discussed later, will prevent many losses. Too ambitious and extensive plantings may result in subsequent maintenance being beyond the capacity of residents.

Auckland residents generally were keen to have trees planted whether by themselves or by the local body. Only a few people in streets where planting was proposed strongly objected to trees outside their residences. Their attitude seemed to stem from a dislike of all trees or complete apathy toward any attempt to beautify the surroundings. Other objections were based on more practical grounds and were usually the result of past experiences of street trees: Too much shade, large untidy leaves in autumn, obscured views at street corners, deep shadows at night, interference with overhead lines, and broken footpaths.

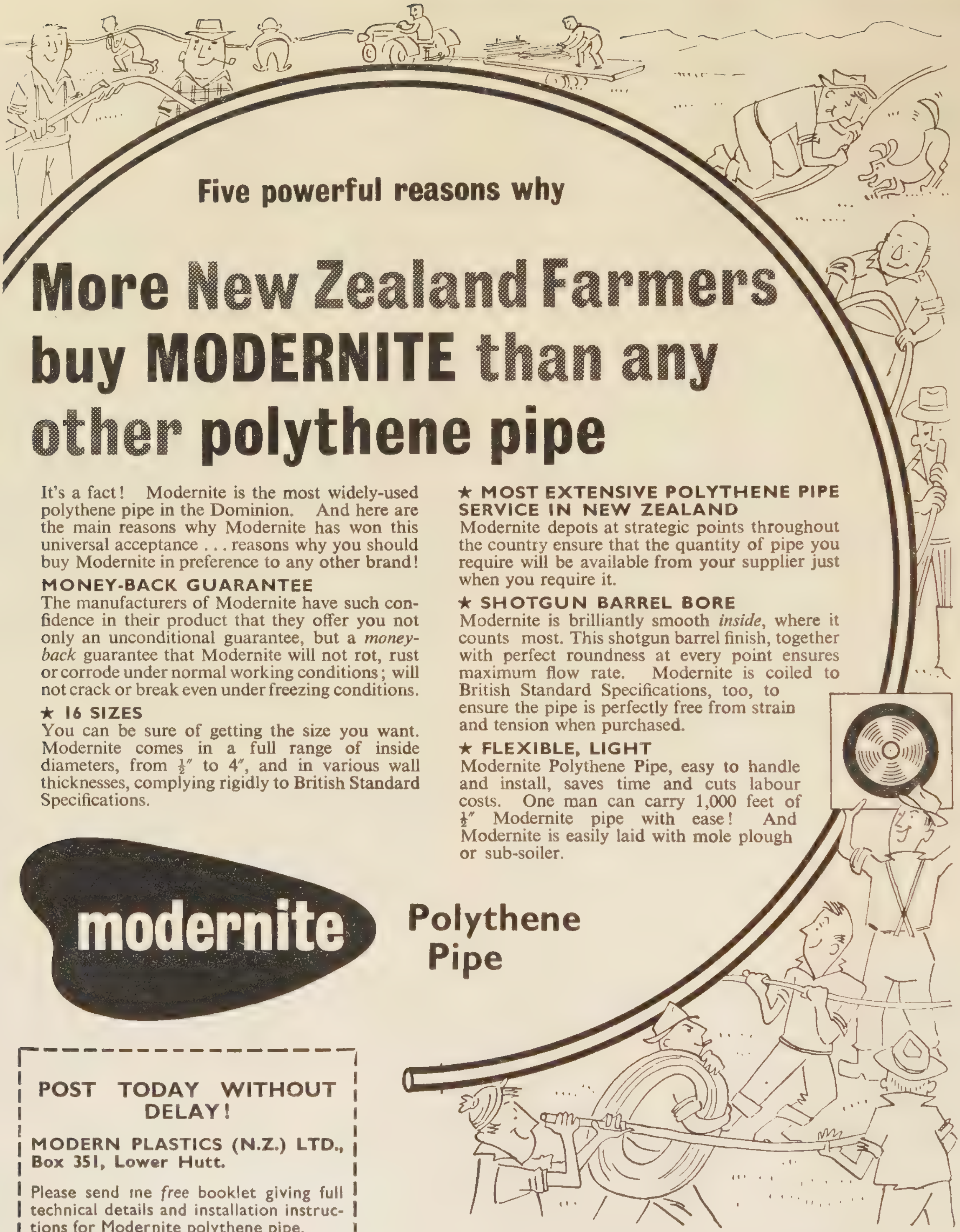
Living conditions depend largely on services installed over and under roads and footpaths, which for our convenience and safety must be well lighted, well paved, and with unobscured views. However, provision of utilities need not preclude tree planting. With skilled planning trees and utilities can share our streets so that we may enjoy both modern amenities and attractive surroundings.

Qualities of Street Trees

Because of the unnatural environment it is not as easy to get trees and shrubs established in streets as it is in gardens, and they are expected to grow without any of the attention normally given to garden plants. Generally they have to contend with poor soil and drainage and a restricted root run, and often they have round them a layer of bitumen or concrete which prevents moisture and air from reaching the roots. In New Zealand fumes, soot, and "smog" are fortunately serious problems only in isolated local areas near some manufacturing plants and railway yards.

Street trees must be tough enough to stand various adverse conditions with usually no watering, mulching, fertilising, or spraying. The number which will do this is limited. Selection is reduced still further when other essential qualifications are considered.

Street trees must be pleasing in form even in winter and have attractive flowers or foliage, but preferably not fruit which, whether edible or not, irresistibly attracts children, with resultant damage to the trees. Fruit from puriris, acmenas, and chestnuts



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[*Sparrow*

Effective plantings of trees and shrubs can often be made in odd corners and islands in streets where they do not create a traffic hazard. Well planted private properties add to the beauty of this street, which is unsuitable for the usual kerbside planting.

can be a nuisance and even dangerous when it falls on footpaths. Very large, thick, or leathery leaves are undesirable, as they do not disperse quickly when they fall. The flowering season should be long or, if short, like that of many cherries, the tree should have other attributes. Fallen flowers can be slippery and dangerous in some situations. Thorny species should not be planted.

A root system which will hold the tree firm is essential, but the roots should not interfere with the levels of roads, paths, sewers, building foundations, etc.; nor should they enter drains or be so extensive that they become a nuisance in adjoining gardens. Species which send up suckers from the roots should be avoided. Only species free of serious pests and diseases should be used, as it is usually impracticable to carry out control measures.

Hard pruning or severe cutting back should not be necessary if suitable species have been selected, but if this drastic treatment becomes necessary, the trees should be able to stand it. Trees with brittle wood can be a nuisance and dangerous. Only long lived trees which grow fairly quickly in the young stages should be used.

Selection of Trees

Before trees are selected the street to be planted must be studied. The width and, less important, the length, should be considered in relation to the size of the trees, as for the best effect they should be in proportion. Small trees or shrubs look out of place in a wide street or a street flanked by high buildings. Spreading trees are unsuitable in narrow streets and streets with narrow verges, as they are a nuisance to both traffic and pedestrians.

The type of traffic a street carries has considerable influence on the selection of trees. Large buses and commercial vehicles need a good deal of head room, and spreading trees, if used, have to be taken up on high standards. The alternatives are shrubs or upright trees.

Small trees or shrubs which block the view at eye level can be a greater traffic hazard than a large tree on a high standard, but in some positions small trees or shrubs may be used to prevent headlight glare. Where buildings are on or close to the boundary line the wrong choice of trees can cause many troubles ranging from the minor nuisance of blocked spouting to damage to building foundations. Aspect and the relative levels of street and houses need to be noted because of shade and views from the houses.

Existing and possible future overhead and underground utilities are usually the greatest bugbears of those responsible for planting and maintaining trees in or near streets. The planes, elms, oaks, and other large species planted in the early days are responsible for an enormous drag on taxpayers' and ratepayers' pockets for repairs to lines and the annual cutting back necessary in many streets. The appearance of the severely lopped trees is far from pleasing, too.

The problem of overhead wires is not confined to New Zealand, as many people believe, but is world-wide and is one which will continue to be faced, as it is unlikely that all power and telephone lines will ever go underground. In any case the placing of cables underground frequently gives rise to more problems than it solves. Where there are four and sometimes six or more sets of wires, pipes, sewers, and drains under the verge there may be no room to plant trees. Trees frequently have their roots cut when repairs are carried out or when additional services are laid.

Newly Developed Areas

In new housing areas discussions between the local authority and those controlling overhead and underground services would be very desirable, as the positions of trees and the various utilities could be decided before any work was done. Cooperation of this kind would benefit all those concerned and would give them an insight into each other's problems, which are often not appreciated.

The natural mature height of trees planted under power and telephone lines should not be more than 30 ft. By careful pruning a tree of this size can be kept within bounds without destroying its shape and habit. If trees of a greater height are selected, they should be species which are slow to reach maturity. Only by careful selection now will the streets of the future be free of the grotesque heavily lopped trees seen in so many towns.

To give variety and interest taller trees should be used in streets wherever possible. There are often small open spaces, usually at intersections, where tall trees on high standards could grow without creating a traffic hazard.

Placing the grass verge between the footpath and frontages of sections allows greater use to be made of taller trees where there are overhead lines, as they have more room to develop. Other advantages are that drivers have a better view along the street and street lights are obscured less.

Wherever possible the trees in a street should be of the same kind to avoid a ragged appearance, except in very long, straight streets, where the effect can be monotonous. To avoid this, sections of the street can be planted in different kinds or a few much larger trees could be introduced at irregular intervals.

Two kinds planted alternately can be effective, provided the contrast is not too great. Mixed trees or mixed trees and shrubs of various shapes and sizes give an untidy appearance.

Deciduous trees are generally preferable to evergreens, which can become a nuisance in winter because

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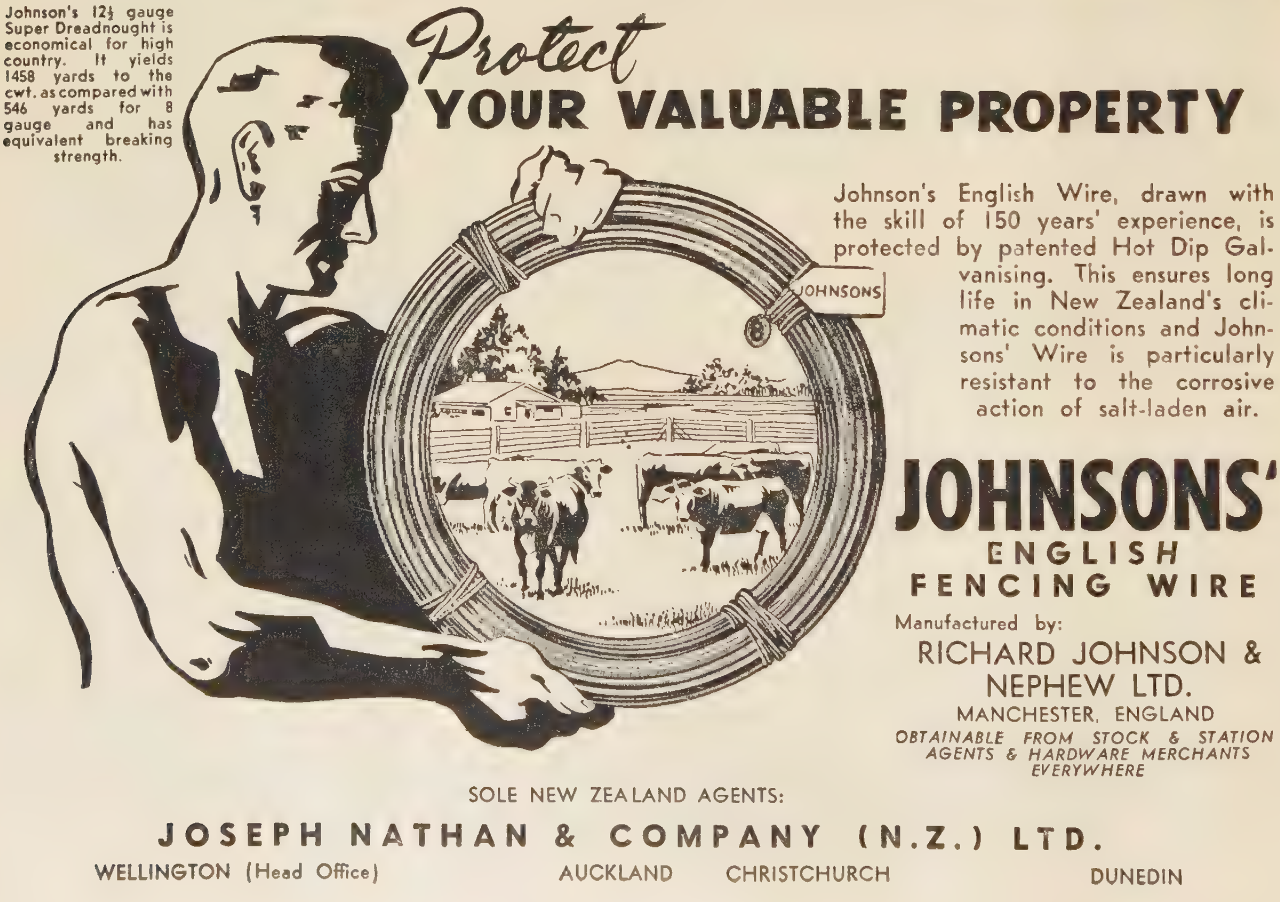

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[Sparrow

Where the grass verge and frontages adjoin, streets can have a pleasing, spacious appearance with the cooperation of the residents, and the street trees have more room to develop.

of shade. Roads and footpaths can become slippery because they do not dry out and frost does not melt. Shade can also affect nearby homes and gardens. Evergreens should be planted only in carefully selected positions.

Trees on standards are better than shrubs or trees with branches to the ground. Low-spreading branches make mowing more difficult and unless some hand cutting is done grass and weeds grow up round and through them. This not only looks untidy but is harmful to the plants. Small shrubs suffer more damage, both deliberate and accidental, than trees and rarely look effective.

Spacing depends on many things—the kind of tree or shrub, type of street, traffic, position of poles, entrances, etc. Usually, medium-sized trees are planted 40 to 50 ft apart with no tree closer to an intersection than 35 to 40 ft. Large trees should be about 80 ft apart. Shrubs may be planted closer than medium-sized trees, but 35 to 40 ft should be left at intersections.

In the present subdivision of old-established estates into building sections, lack of appreciation of trees by some vendors and purchasers is causing the destruction of some of the finest specimens in the country. With a little care many of these could be preserved as street trees or as specimens in the new gardens.

Some of our most attractive streets have no street trees. Their beauty comes from the trees planted near the frontages of private gardens. This is a form of planting which should be encouraged, for it improves the appearance of the streets without any of the difficulties associated with normal street planting and would reduce the costs of local bodies and supply authorities. A lead in this direction could be given by residents in many short streets and cul-de-sacs, where it should not be too difficult to get agreement on a group planting scheme.

Digging the Holes

Successful establishment depends very largely on the preparation of the site. Good soil is rarely found on the roadsides. Very frequently the original levels have been altered when the roads were laid down, so that the verges are likely to consist of the original subsoil or a thin layer of soil over filling. In new streets the soil is likely to be heavily compacted by trucks and earth-moving machinery.

Whenever possible the sites should be prepared well before planting time and the soil put back into the holes. Autumn is a good time, as the soil is in a suitable condition for digging. If digging of holes is left until the last minute, the soil is usually too wet and planting either has to be delayed or the trees are put into soil not fit to receive them.

The holes should be at least 2 ft across, preferably 3 ft, and 18 in. to 2 ft deep. The bottom of the hole should be dug over and loosened up to another spade depth. This is especially important where the soil is heavy and poorly drained. Early preparation and loosened subsoil will help to prevent the hole acting as a sump for drainage. If the soil is poor, it is advisable to fill in the holes with some good soil or to mix some in.

Planting

Most trees may be planted from late autumn to early spring, provided soil and weather are suitable. In very

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cold districts evergreens and conifers should be planted in late autumn so that they may become established before winter, or they may be left until spring. The former is preferable. Because of lack of time planting often has to be done when conditions are not ideal. Prior preparation of planting sites will reduce the likelihood of losses.

Neat stakes which can be expected to last for at least three years should be driven firmly into the ground just before planting. For trees on high standards 6 to 8 ft stakes are necessary. Good ties are essential. Strips of canvas or rubber wrapped round the tree and nailed to the stakes are suitable.

Small trees and shrubs are likely to be damaged by children playing or riding bicycles, during mowing of the grass verge, or by residents' carelessness. Three stakes driven in round a plant usually give satisfactory protection, if they are tall enough to deter children from trying to jump over them. Larger trees will not usually need guards.

After Care

As a rule it is not possible for the planting authority to water the plants during a dry spell in the spring and summer after planting. Residents, whether active participants in the planting scheme or not, could do a great deal to assist trees to become established by watering, mulching, and keeping weeds down.

Ties need to be examined twice a year to ensure that they are secure and are not cutting into the tree. This is normally the responsibility of the local body, but residents could help by tying up trees that have broken loose and by replacing stakes that have been loosened or broken.

Pruning is sometimes necessary to shape young plants. This operation requires skill and a knowledge of trees and should be done only by someone with the necessary qualifications. In larger towns the parks department usually has a suitable person. Small local bodies that have no officer with the requisite experience should seek outside advice.

Maintenance of Established Trees

Established trees require very little pruning to maintain their health and vigour and if the species have been selected with care, they may be left without attention. Trees which grow too large for their positions may require annual pollarding (removal of all branches back to a central head), an occasional shortening back, or the complete removal of limbs. These jobs should be done only by someone with the necessary skill and a knowledge of trees.

Trees which have grown too large for their positions or are approaching that stage are difficult to deal with. The size of the tree and its age and condition, rate of growth, and reaction to pruning or severe cutting back are the most important points to consider. With plane trees and others which have been pollarded regularly for years, so that they are little more than trunks with leafy topknots, there are usually only two choices: continuation of the treatment or removal and replacement by more suitable species.

Some trees, such as peppers (*Schinus molle*), will break into growth from old wood when cut back very severely. Given this treatment every few years they can be kept within bounds. They look unsightly for a couple of years and then, with a little thinning and shaping, can be made to assume their natural shape.

Many streets are lined with old trees of considerable size which have had their tops cut out or side branches removed at intervals as they have touched wires or when new lines have been put in. Unless this work has been done carefully there are usually numbers of stubs which, if left, will rot back into the main limbs or trunk and so gradually reduce the tree to an unhealthy condition. These stubs and broken or damaged branches should be cut off cleanly. Sometimes it is possible to help the tree to regain its natural form by thinning out the mass of small branches which have arisen from a cut branch, by removing double leaders, or by removing other branches to give balance.

Younger trees which are reaching a stage where they will become a nuisance in a few years should be treated before they reach a point where they require drastic cutting back. Some trees can be reduced in size without permanently destroying their natural character by cutting back the leading branches to strong side growths, which will then become the leaders.

If only a few of the simple rules were followed when trees were being pruned or limbs removed, there would be a considerable improvement in their appearance. All cuts should be clean. Limbs and smaller branches should always be removed at their bases without leaving stubs. Branches or shoots which have to be shortened should be removed to a side growth, again without leaving a stub. Axes and slashers are not suitable pruning tools.

Purchasing

When street trees are being bought only the best available should be selected, as they have to fight against many adverse conditions. Weak, poorly grown plants with inadequate root systems will never make good trees. Most street trees should be on 5 or 6 ft standards and should have a good, compact root system. Such trees may take several years to grow and require a considerable amount of training and consequently will not be cheap. Evergreens should have good fibrous root systems and should be balled in scrim or sacking. If pot- or container-grown plants are used, they should not be severely root bound, as such plants are often difficult to get established.

Nurserymen cannot be expected to produce large numbers of suitably grown trees at short notice. Orders should be placed with a reliable nurseryman well before the planting season, or if possible a year or even two before they are required. In this way good trees are ensured. "Cheap" trees, especially if bought toward the end of the season, should be avoided. Misshapen, shrivelled, or stunted trees should likewise not be bought. It is better to miss a season than to plant a poor tree.

If trees cannot be planted as soon as received, they should be heeled in in a sheltered position and not left lying about in a yard exposed to sun, drying winds, and frosts. They should be handled carefully and not left too long out of the ground when they are being delivered to the planting sites.

Removal of Trees

Opposition to planting of trees in streets is usually passive, but when the removal of old trees is suggested opposition is likely to become vociferous. That trees should have their protectors is good, but frequently opposition to removal is based on sentiment rather than practical considerations. Oaks and elms planted 80 or more years ago give character and dignity to some of our most beautiful streets, but many are now reaching the end of their useful life.

Eighty years is not a great age for these trees, but the warmer parts of New Zealand are not suitable for them. A general decline in vigour, neglect, and ill treatment have aged many of these trees prematurely. Others which have been severely mutilated over the years to keep them away from wires are little more than gnarled stumps screened by leafy shoots in summer. Examinations have shown that many of these old trees, especially the elms, are rotten inside, though they appear healthy at a casual glance and will become more decrepit and dangerous.

If a policy of gradual replacement by more suitable species was adopted now, the beauty of these streets would be ensured for the next 50 or perhaps 100 years. Even where unsuitable trees are in comparatively good condition, as many mop-headed planes are, replacement is advisable to save the recurring and ever-increasing cost of annual lopping.

Every endeavour should be made to preserve historic trees that are reasonably safe.

Recent Research Work

Responses in Phosphate Trial at Winton

THE superiority of superphosphate on a particular soil type in Southland was indicated in the trial described below. This was complementary to a large number of observational trials conducted in which calcium-magnesium fused phosphates were compared with superphosphate and basic slag. In this trial, however, actual yield data were obtained.

THE trial was laid down on the Otapiri gley soil type by the Department of Agriculture on Winton Experimental Farm in the spring of 1954. The pasture was run out and dogstail dominant, with a little ryegrass, weak white clover, and some moss. Calcium-magnesium phosphate in both fine and coarse forms, superphosphate, and basic slag were applied to plots at equal phosphate equivalent rates. The actual rates were 2 and 4 cwt per acre and the trial was retopdressed in the spring of 1955 and 1956.

DESCRIPTION OF CALCIUM-MAGNESIUM PHOSPHATE

Calcium-magnesium phosphate is produced by a fusion process in which a mixture of phosphate rock and dunite is fused in an electric furnace and cooled rapidly by being poured into a stream of water. Serpentine can be used as an alternative to dunite, and as there are natural deposits of both in Southland, the trial was of some importance.

In the trial at Winton both finely crushed and coarse samples of this form of phosphate were used. Hereafter, these are referred to as fused phosphate (fine) and fused phosphate (coarse).

YIELD RESULTS

Mowing yields in the 1954-55 season showed substantial differences between the forms of phosphate used, but only slight differences between the 2 and 4 cwt applications. In fact, throughout the trial differences between the rates of application were negligible. Yield differences between plots are indicated in the following table.

Mean Yield per Treatment in Pounds of Dry Matter per Acre

	1954-55	1955-56	1956-57
Untreated	4,890	5,670	7,060
Superphosphate	6,600	7,460	10,320
Basic slag	5,750	6,120	7,950
Fused phosphate (fine)	5,300	5,880	7,830
Fused phosphate (coarse)	5,290	5,740	7,820

Throughout these three years the superphosphate treatment was markedly superior to the treatments with other forms of phosphate; the fused phosphates proved little better than control and inferior to basic slag.

SWARD COMPOSITION

Apart from yield data herbage dissection analyses showed changes in botanical composition. The general trend was that in the superphosphate and basic slag plots white clover increased in density, though this change was more marked in the superphosphate plots. In addition, the ryegrass content of the superphosphate plots also increased slightly. Apart from these changes the other treatments remained unchanged.

At no stage of the trial was it possible to pick by eye any treatments other than the superphosphate treatments, the increase in white clover being evident for a long period.

LENGTH OF RESPONSE

In 1957 the plots were not retopdressed and there was an almost immediate drop in production on all the phosphate plots compared with that from untreated plots. Topdressing was purposely omitted to discover the ability of the various phosphates to maintain the response. Normally the slower acting phosphates are regarded as longer lasting and it was felt that if topdressing was suspended, they would compare more favourably with superphosphate. This did not, however, prove to be the case and though responses became much smaller, superphosphate was still superior.

In the following table this drop in yield is shown by a comparison of relative yields over the four years of the trial; 100 is equal to the mean yield of the control plot each year.

Relative Yields in Pounds of Dry Matter per Acre

	1954-55	1955-56	1956-57	1957-58
Untreated	100	100	100	100
Superphosphate	135	132	146	110
Basic slag	118	108	113	104
Fused phosphate (fine)	108	104	111	102
Fused phosphate (coarse)	108	101	111	105

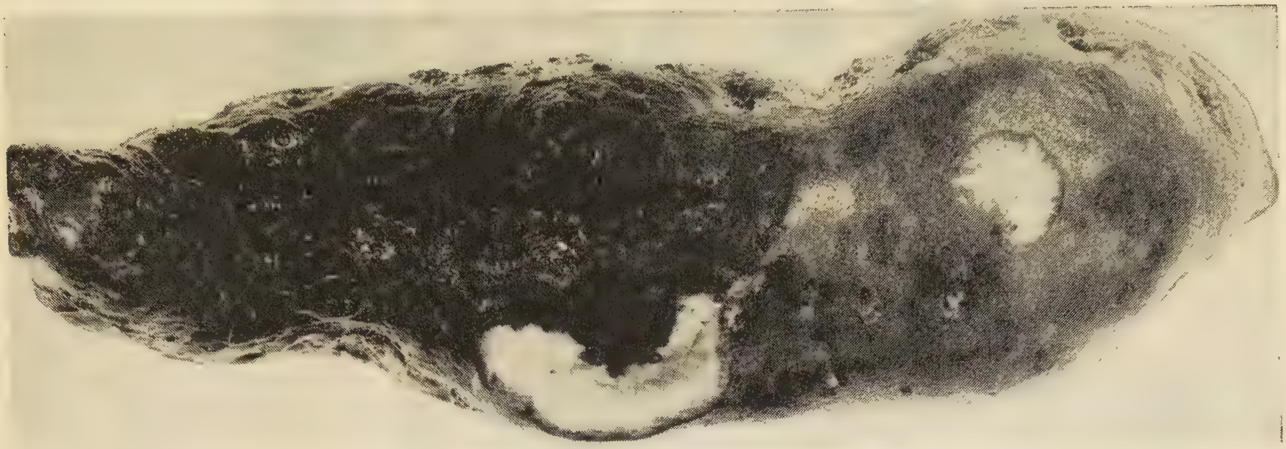
CONCLUSIONS

The superiority of superphosphate was quite marked, but as it was the only form of phosphate used which contained sulphur, the possibility of a sulphur response could not be discounted. For this reason in 1955 a sulphur trial was laid down adjacent to the phosphate trial. In four years this trial failed to give a sulphur response.

The yield information obtained in the Winton trial therefore gives data and statistical measurement of the difference in effectiveness of the various phosphates on this particular soil type.

—*A. R. RANKIN, Fields Instructor,*
Department of Agriculture, Invercargill

Black Rot an Important Disease of Kumaras



[Plant Diseases Div., D.S.I.R.

A kumara tuber infected with black rot (white areas are where skin has been pared away with a knife). Large black lesions cover the left two-thirds of the tuber.

By D. A. SLADE,

Horticultural Advisory Officer, Department of Agriculture, Auckland

GROWERS of kumaras in the north of the Auckland Province are finding it increasingly difficult to produce crops because of black rot destroying plants and tubers. This disease has already severely curtailed kumara growing on Matakana Island, Bay of Plenty, and could in future limit the available productive area if steps are not taken to stop the disease spreading into areas at present free from it. This article describes the disease and discusses the best ways for growers to prevent it becoming a problem on their farms.

BLACK ROT of kumaras is a disease of stored tubers and below-ground portions of plants and tubers in the field. The disease was first found at Kaitaia in 1947 and has since been recorded from the Bay of Islands (1949), Helensville (1950), Great Barrier Island (1954), Auckland (1956), and recently from Gisborne. During the 12 years since the disease was first recorded several growers have suffered severe losses; some crops have been totally destroyed.

Because of the severity of the disease and the ease with which it can be introduced into clean land growers should be aware of the nature of the trouble and prevent it from becoming established in their crops.

In America the disease, which is present in all states growing sweet potatoes, is very serious and causes losses of tubers estimated to equal the losses from all other diseases.

Disease on Tubers and Plants

Black rot may occur on any underground part of the kumara plant, but it does not attack above-ground parts. The fungus causing the disease may be introduced into propagating beds on seed tubers. Young plants may become infected if they are raised in propagating beds contaminated with the fungus or transplanted into contaminated soil. The fungus attacks young plants, causing small black spots on the stem which quickly enlarge and coalesce to form an area of rotting tissue. Plants attacked in this way turn yellow and eventually die. Areas of young kumara plants have been lost because of this rot, which is sometimes referred to as black shank.

The fungus also attacks the tubers and causes black sunken areas. Black spots, at first too small to be seen, will under favourable conditions enlarge and may eventually cover most of the kumara (see illustration). The centres of older infections (lesions) may be lighter coloured and have a slight metallic lustre.

Black rot is also a serious disease of stored kumaras. Apparently clean tubers may have infected areas which are not detected when they are sorted before storage. During storage temperatures and humidity are usually favourable for the development of black rot, and the small spots which were not noticed after harvesting will gradually enlarge. After some weeks these spots may reach the size of a half-crown or larger, become sunken, and cause discolouration of the tissues of the tuber.

Though the black area is confined to the superficial layers of the kumara, the dark, discoloured area extends into the flesh, often to a depth of ½ in. or more. The flavour of the kumara is spoilt even some distance from the rot, and infected kumaras are not suitable for cooking.

Spores too small to be seen with the eye are produced abundantly from mature lesions. These spores adhere readily to insects, sacks, cases, soil particles, etc., and may be brought into contact with clean tubers during harvesting, storage, and transport. New infections occur when the spores germinate and enter the tubers, usually through minor skin injuries.

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Because of the presence of spores on most infected tubers kumaras should not be washed. One diseased kumara producing spores may contaminate the wash water and spread spores, potential sources of infection, to other kumaras. Diseased tubers should not be fed to stock if the land is likely to be used for kumara growing in the near future.

Causal Fungus

Ceratocystis

The fungus causing black rot is called *Ceratostomella fimbriata*. It survives from one season to another on infected plants and tubers remaining in the field after harvesting and on diseased kumaras in storage. It may be spread from one farm to another by exchange of diseased tubers or infected kumara plants. This fungus may survive on decaying kumara plant matter in the soil for up to three years.

Growth of the fungus is greatest at temperatures between 73 and 81 degrees F. At 50 degrees F, the lowest temperature at which kumaras may be stored without damage, the fungus can still make slow but steady growth. Little or no growth occurs at temperatures above 95 degrees F. In experiments using heat as a method for control of black rot kumaras have been held at 110 degrees F for 24 hours. This treatment killed the fungus without damaging the kumaras.

No New Zealand varieties appear to be resistant to black rot. In America no known commercial varieties are immune to black rot, but several unnamed seedlings have been discovered which are highly resistant. So far these seedlings have not been used by commercial growers, but it is possible that a suitable commercial variety may some day be developed.

Control by Good, Clean Seed

Growers should start their protection programme right from the time tubers are selected for seed by using disease-free tubers for propagation and clean plant beds, and by practising root disinfection and crop rotation.

Because the disease affects only below-ground parts of the plants, the most practical way of obtaining seed kumaras entirely free from black rot is to grow a special line of tubers from cuttings. Cuttings may be taken either from the normal seedbed or from vines in the field and rooted in sterilised soil or in soil which has not grown kumara plants for several years. Plants produced from these cuttings should be planted out into a field free from black rot infection. The kumaras produced will also be free of the disease and suitable for propagating.

The cuttings should be made as early in the season as possible to give enough time for the formation, by autumn, of tubers suitable for propagation. It will be necessary to grow a further crop of tubers from this nucleus seed to obtain sufficient plants for commercial requirements. The extra time and expense involved in producing disease-free nucleus seed tubers from cuttings and propagating seed tubers from these will be repaid by increased crops of disease-free kumaras.

Selecting tubers for propagation from commercial lines is not satisfactory. Small lesions of black rot may not be noticed and during storage will continue to develop and spread. Because kumaras often mutate and produce off types, only tubers from plants producing a good weight of kumaras of a desirable shape and quality should be selected for propagation. Only the best lines will then be perpetuated. Care should be taken not to damage tubers selected for seed and special attention should be given to storage over winter.

It is advisable to dip the tubers in a fungicidal bath before storage to kill spores which may be adhering to them. "Phygon XL" used at the rate of 1 lb per 100 gallons of water has been found satisfactory. The tubers should be allowed to dry after steeping and before storage. The dip should be repeated before the tubers are set in the propagating bed. (It must be stressed, however, that this treatment kills only the spores on the surface of the tubers and does not kill any fungus inside them.)

Growers who do not produce their own kumara plants should ensure that they do not introduce the fungus into clean land by buying in plants from areas where the disease is prevalent.

Rejected kumaras should not be left on the land, but should be removed after marketable tubers have been picked up. If this is done, less diseased plant material will be left and black rot will not have the chance to build up to any extent.

Treatment of Propagating Beds

If sand or soil in which kumaras have not previously been grown is unavailable, the soil should be sterilised. Either formalin drenches or chloropicrin treatments are satisfactory. Treatment details are described in Department of Agriculture Bulletin No. 363, "Disinfection of Nursery Soil". Frames, paths, sashes, and any material used for covering the beds should be sprayed with a 1 per cent formalin solution to ensure that any spores of black rot fungus are killed. Enough time must be allowed for the gases to escape after treatment before the kumaras are placed in the beds. At optimum soil temperatures about four weeks would be required for dispersal of formalin fumes and two weeks for chloropicrin.

Control by Crop Rotation

Growers who already have had black rot in their crops will find control easier if they practise crop rotation and maintain a high degree of sanitation. Growers who do not rotate crops run the risk of permitting the black rot fungus, if once introduced, to build up in the soil. In some areas this has developed to such an extent that kumara production has now been discontinued.

At least a three-year rotation with other crops appears to be desirable. This short-term rotation is possible because the fungus cannot survive on plants other than kumaras. However, when land has had a high build-up of diseased material, to the point where kumaras can no longer be successfully grown, longer periods may be required to ensure that the fungus is reduced to a degree which would permit a crop to be grown without serious infection resulting. Rotation periods of from four to six years have been suggested as desirable when the trouble is prevalent.

Many growers, however, have insufficient land available to practise rotation to the extent required once this disease is introduced on to their land, and therefore it is important that they do not introduce black rot on to their properties. Though clean plants planted into infected soil will become infected and the trouble gradually develop to become a serious problem, this does not mean that growers should not produce clean plants. Any method used to eliminate infected plant material at the planting out stage will ensure that areas already free from the disease will have a better chance of remaining so.

It has been found in America that treating the soil with sulphur, lime, gypsum, and various fertilisers has little effect on the incidence of the disease in the crop. Dipping the plants in fungicidal baths before setting them in the field sometimes reduces the incidence of the disease, but does not entirely prevent it. The efficacy of soil fungicides, fumigants, and sterilants which are suitable for field application is unknown. Possibly some of the newer materials recently available to growers may be suitable, but trial work is required before their use can be recommended.

The need for control of this disease should be avoided by preventing it becoming established.

Storage of Kumaras

Only tubers from areas free from black rot should be stored for any considerable time. A special curing house is desirable in which the tubers can be held at a high temperature (80 to 85 degrees F) and humidity (80 to 85 per cent relative humidity) for 10 days to promote the development of a thicker skin and the healing of wounds received during harvesting. After this curing period temperatures should be lowered to 55 to 60 degrees F, but the high humidities should be maintained to reduce weight losses caused by wilting. The curing process protects the tubers from infection by spores, which enter mainly through minor skin wounds.

In sheds which do not have facilities for controlling temperatures and humidities care should be taken to prevent any skin injuries when tubers are handled before or during storage. Boxes and equipment in the shed in which the tubers are to be stored should be sprayed down with a 1 per cent formalin spray some time before the tubers are placed in storage.

Because spores are carried readily on dust, sacks, and all types of equipment, the storage areas should be kept tidy and clean throughout the year. Dusty sheds with accumulated rubbish, sacks, or soil provide excellent conditions for harbouring spores. Old tubers and kumara plant material left about the store provide material in which the fungus can survive from one season to another. Tubers with black rot should be disposed of immediately by burying deeply in the soil or burning.

Seed tubers should be stored away from other tubers to reduce the risk of infection from spores produced or carried by commercial lines, and before being stored should be treated with a fungicide as previously described to protect them against new infection. Tubers which are to be used for food cannot be treated in this way.

Producers' Responsibilities

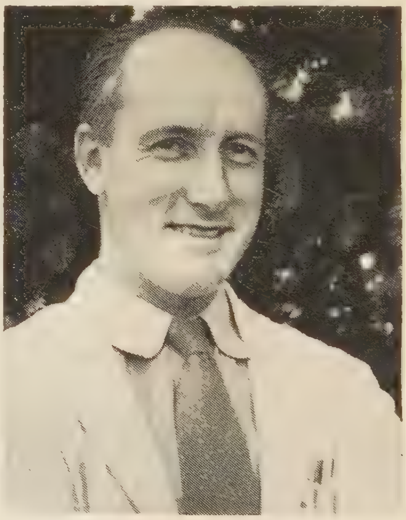
Great responsibility rests with the producer of kumara plants for sale to ensure that he does not help spread the disease into clean areas by offering for sale plants raised from diseased tubers or grown in infected soil. Similarly, diseased tubers should not be offered for sale, particularly when they may be used for propagation. Diseased tubers are not suitable for cooking and are quite likely to be thrown out by the housewife. These discarded kumaras are a potential source of infection in a locality often far from the area where the kumaras were produced.

To summarise, precautions which should be taken are:

1. Select clean tubers of good type and quality for propagation.
2. Protect the selected tubers with a fungicide, for example, "Phygon XL" dip.
3. Handle the tubers carefully and as little as possible.
4. Eliminate the disease from propagating material by use of sprout or vine cuttings.
5. Each season establish on clean land a special block to increase the nucleus seed tubers required for propagating the following season's plants. Maintain this block, using either nucleus seed tubers produced from vine cuttings or selected from parent plants producing tubers of a desirable type and weight.
6. Use new sand or soil in the propagating beds or sterilise with chloropicrin or formalin.
7. Treat tubers before bedding with a fungicidal bath such as "Phygon XL".
8. If black rot is likely to be present, dip plants in a fungicide before planting out.
9. Practise a three- or four-year rotation.
10. Don't buy in kumara plants unless they are known to be free from black rot and have been raised from disease-free tubers.
11. Maintain clean storage facilities and destroy all infected tubers immediately. Do not allow the spores produced by them to contaminate sheds, equipment, or the soil.

Doctorate of Science for Ruakura Chemist

Dr E. P. White, Senior Principal Scientific Officer at the Department of Agriculture's Ruakura Animal Research Station, was last year awarded a Doctorate of Science by the University of New Zealand for research on the alkaloids of leguminous plants and related chemical studies.



Dr White.

Dr White was for a number of years engaged in chemical investigations of pasture in an attempt to isolate the liver damaging factor responsible for facial eczema. When the fungus was discovered he had prepared extracts in which the toxic substance was present in high concentration. Investigations were then concentrated on the substance's isolation from fungal cultures, and largely as a result of this pioneering work Dr White and Dr R. L. M. Synge, a Nobel Prizewinning chemist working at Ruakura on loan from the Rowett Research Institute, isolated the toxic substance, which was later named "sporidesmin".

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during December 1959 and for the five months ended 31 December 1959 with comparative figures for the same month and for the five months of 1958 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
December 1959	23,678	450	24,128	—
December 1958	26,015	372	26,387	—
Increase or decrease	—2,337	+78	—2,259	—8.561
5 months ended 31/12/59	100,361	1,724	102,085	—
5 months ended 31/12/58	107,816	1,480	109,296	—
Increase or decrease	—7,455	+244	—7,211	—6.598

Butter in store at 31 December 1959 was 22,391 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
December 1959	12,985	1,235	14,220	—
December 1958	9,865	2,621	12,486	—
Increase or decrease	+3,120	—1,386	+1,734	+13.887
5 months ended 31/12/59	43,650	6,153	49,803	—
5 months ended 31/12/58	34,049	8,270	42,319	—
Increase or decrease	+9,601	—2,117	+7,484	+17.684

Cheese in store at 31 December 1959 was 14,451 tons

If these figures are converted into butterfat equivalent, there is a decrease of 2.988 per cent in butterfat graded for the five months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Subsoiler Digs out Old Fruit Trees

THE idea of pushing instead of pulling a subsoiler has provided a very efficient and cheap method of removing fruit trees on the orchard of Mr E. Harris, Otiake, Kurow. The removal of 4,483 trees 49 years old promised to be a long and costly job using either chains to pull or a bulldozer blade to push them out, but Mr Harris expected to remove and stack them with the subsoiler in about a month.

MR HARRIS reversed the tool-bar carrying two subsoiler shoes on a crawler tractor, and experimented until he had the tool-bar set at the correct angle. The subsoiler shoes were set 20 in. apart.

In a demonstration six trees were removed in 10 minutes. Further adjustments were made and on the day the accompanying photographs were taken, two officers of the Department of Agriculture saw 12 peach trees lifted cleanly and laid in a row in just under five minutes.

Lifting and Stacking

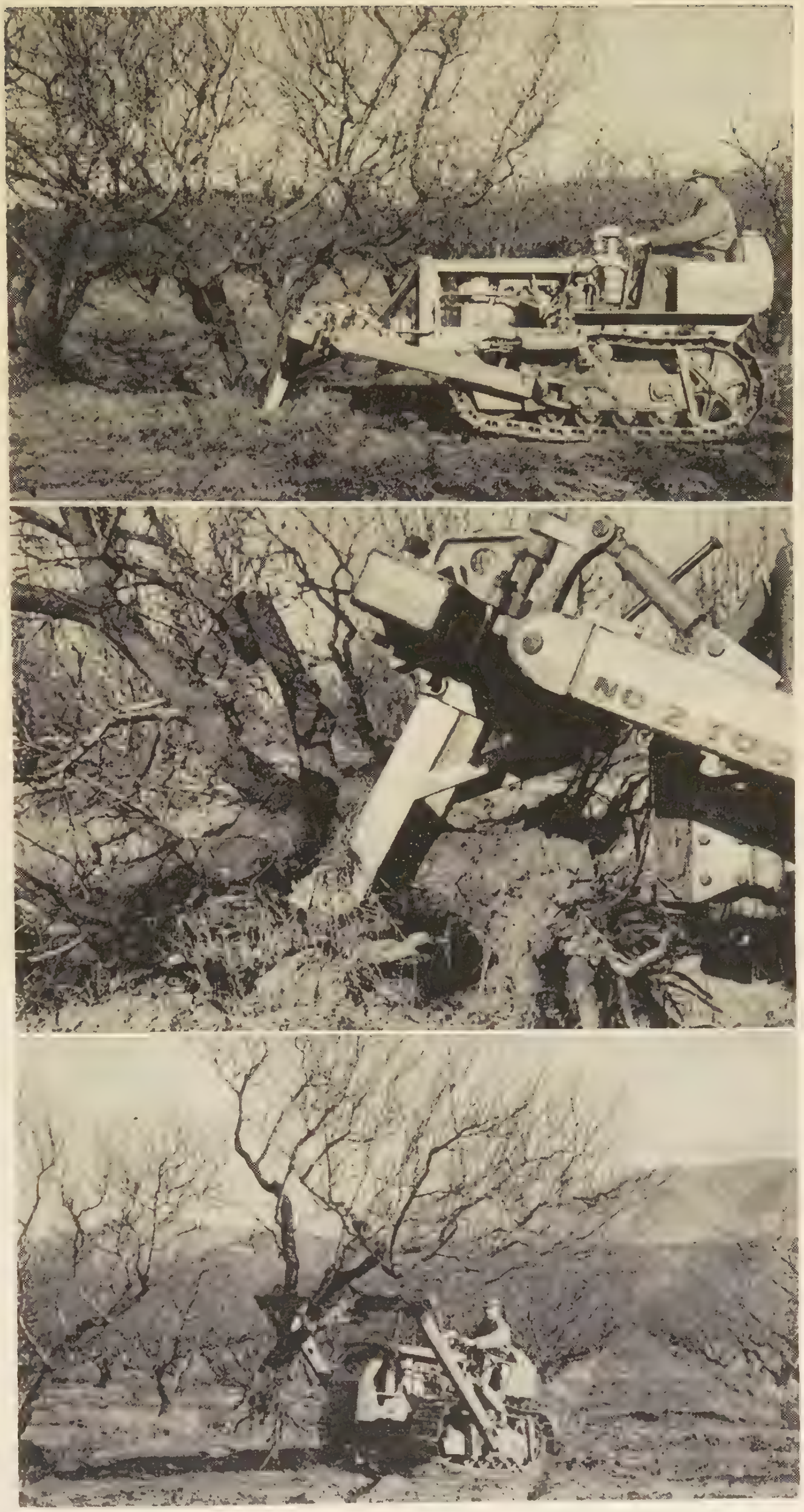
The shoes entered the soil 9 to 10 in deep and the tractor did not have to stop, though on less than half throttle. When the tree was free from the ground the bar was lifted 3 ft by the hydraulic system and the tree carried to and packed tight in a large stack for burning later.

Very large trees are first given a push with the tool-bar raised to about 4 ft.

Apart from being much faster than any other known method, two great advantages are that very little soil is retained on the tree and only a small hole is left. This is a major point when it comes to levelling off, which is simply done by returning the tool-bar to its normal position and using the subsoiler as a cultivator. Any pieces of roots left are thus brought to the surface.

Removing the trees by any other method would have been a long and costly job requiring much levelling afterward. With this machine, employing no helpers, Mr Harris expected to remove and stack the trees in about one month.

—D. A. RICHARDSON,
Plant Quarantine Officer,
Department of Agriculture,
Timaru



Top—The subsoiler in the ground at the base of a tree. Middle—The tree gripped by the subsoiler shoes and pulled out of the ground. Bottom—The tree being carried away for stacking.

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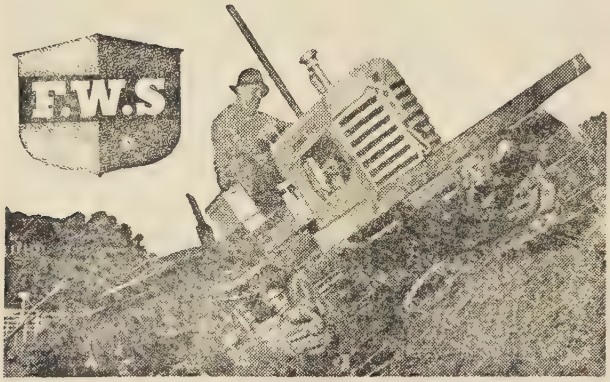

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The Home Garden in May

WORK in most home gardens in May should largely be confined to digging, tidying, sowing hardy green crops such as oats or barley, and setting out well rooted cabbage and perhaps cauliflower. Temperatures for the next two months in most districts are not favourable for good growth of seedlings of any but the hardiest vegetables.

[*Sparrow*

Potatoes are best dug when mature; if they are left, they may be injured by pests or diseases.

USUALLY digging and much tidying is needed in the home garden in May, as the residues of half-hardy crops such as tomatoes, beans, marrows, pumpkins, and potatoes have to be cleared away and the land they occupied dug over. Nothing is to be gained in most gardens by planting or sowing any but the hardiest vegetables, as usually the weather will become progressively less favourable for growth until the shortest day.

Some sowing and planting may be done if the soil is well drained and cultivated. If firming of the soil is necessary, it should be confined to the seed or plant rows and done only in moderation to medium and heavy soils. A simple method of testing soil condition for sowing is to walk on it. If it sticks to the soles of the boots, it is too wet.

It is not advisable to plant or sow even hardy subjects in cold situations where the soil is heavy and poorly drained. Temperature and other aspects of the weather are not usually so favourable that the plants should be subjected to the additional hazard of a cold, wet soil if this can be avoided.

In most gardens where the soil is well drained cabbages and cauliflowers can still be set out as advised in last month's "Journal" and, where conditions are not likely to be too severe, lettuce as well. Broad beans and spinach can be sown and in some districts peas, but unless the garden is in a very favourable situation and the weather is very good, it is best to defer sowing seeds of such plants as carrots, onions, turnips, and even radish until July, August, or September according to conditions.

The top growth of asparagus should be cut down as soon as it begins to turn yellow and digging of kumara and potato crops should be completed without delay. Potatoes and other root crops in store should be sorted over to remove those with rots.

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

Vacant ground can be sown with a hardy green crop such as oats or barley and, if necessary, limed, and attention given to the compost heap and to the burning of diseased or woody rubbish. Rhubarb beds should be weeded and the seed stalks removed. Rhubarb plants with mottled or streaky leaves, indicating virus disease, should be dug out and burnt.

Weeds among crops or round the edges of the garden should be destroyed, as they may be the means by which pests such as thrips, mites, and aphids, which are often considered more serious than weeds, are carried over from season to season.

They may also serve as host plants for virus and fungous disease with which insects could infect the next season's crops.

Broad Beans

May is usually the preferred month for sowing broad beans, as they are very hardy and do well in cool conditions. As broad beans are easy to grow and most varieties will produce a good crop with very little attention, they deserve a place wherever their flavour is appreciated. The earlier sowings usually mature when fresh vegetables are scarce and lacking in variety.

Broad beans do not require special soil, but it is not advisable to sow them in wet, stick soil or light soil that tends to dry out. They do well in fairly heavy, moist, well drained soils that have been well cultivated and into which has been worked, if the soil lacks organic matter, a moderate amount of material such as compost or well rotted farmyard manure.

The principal plant nutrient required for broad beans on most soils is phosphoric acid, which can be supplied by superphosphate or by bone manure, though on soils such as those in many home gardens that have been cultivated for many years without a balanced manurial programme, a complete fertiliser containing nitrogen, phosphorus, and potash is likely to give best results. Apart from their nutrient value phosphates are said to have a stimulating effect on the nitrogen-fixing bacteria on the roots of broad beans.

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Broad beans require only a small amount of nitrogen. A mixture of 1 part of sulphate of ammonia, 4 parts of superphosphate, and 1 part of sulphate or muriate of potash, all by weight, or alternatively 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate or muriate of potash worked in at 2 to 3 oz to the square yard, according to the fertility of the soil, will give good results on most soils that have been well dressed with balanced fertilisers for previous crops.

Though broad beans are tolerant of a fairly wide acid-alkaline range (pH), they will not thrive in excessively acid conditions. In districts with moderate to heavy rainfall growth in most soils not recently limed will be improved if carbonate of lime at about 2 to 4 oz to the square yard is worked in some time before sowing.

Apart from weed control, beans should require little attention when young, but it is usually advisable in winter or early spring when the weather is boisterous to draw a little soil against the stems of autumn-sown plants to support them. Tall growing varieties can be stopped when they are about 30 to 36 in. high by pinching out the tops. This encourages the plants to develop sturdy growth and is often sufficient to check black aphid attack, particularly if the aphids' natural enemies, such as lacewing flies and ladybirds and their larvae, are numerous.

In many gardens where tall varieties are grown it is advisable to support the plants as they develop or as they become heavy with pods. One or more strings run along the sides of rows and tied to stakes at intervals of 5 to 6 ft will save the plants from being blown over.

Sowing

Beans sown early in autumn do not necessarily yield pods earlier than those sown in late autumn or early winter, for though the plants may make good growth in late autumn and early winter, they are likely, particularly where winters are fairly severe, to be damaged and checked by disease or by boisterous weather. The earliest flowers often fail to set because they are produced at a time of unfavourable soil conditions and sudden extreme temperature changes, but if spring sowing is necessary, it should not be delayed too long, as the crop may be reduced if it matures in the hot, dry conditions of summer.

In deep, well drained soil broad beans are best set 2 to 3 in. deep, preferably with a trowel, and 4 to 6 in. apart or in the bottom of a drill about 3 in. deep. Seed may be planted in double rows 10 to 12 in. apart, with not less than 26 in. between each double row. Single rows are sometimes preferred; they should be 15 to 18 in. apart.

Germination is usually good, but in the home garden a few extra seeds can be sown at the ends of rows and seedlings later transplanted to fill gaps; young plants should be transplanted as early as possible. Seed varies in size, but a little less than a quart of seed will sow about 50 ft of double row. Germination can usually be speeded by soaking the seed for about 12 hours before sowing. Specially prepared seed dusts, available under various trade names, give some protection to newly sown seed against soil-borne disease.

Varieties

Two main varieties of broad beans are grown in New Zealand, the broad-podded or Windsor type and the long-podded type. The broad-podded type has relatively short, broad pods usually containing about three to five large seeds. Some varieties are Broad Windsor, Giant Windsor, and Harlington Windsor.

Long Pod and Mammoth Pod are examples of the long-podded type, varieties of which may produce pods up to 16 in. long, though usually they are about 5 to 9 in. long and contain four to seven seeds.

Dwarf varieties of broad beans are also available. They are well worth growing in small gardens or in exposed situations, and where conditions are not too hot and dry are also useful for sowing in January (or even February where the growing period is long enough) to mature before winter. The pods contain two to about four small seeds and are usually attached in fan form. The foliage is small, often fairly dark, and the internodes are very short. Examples of the type are Cole's Early Dwarf and Dwarf Gem.

Lettuces

Lettuces for setting out or growing in early spring can be sown in May in a favourably situated cold frame or in a favourable situation in the open where the soil is well drained. Where these conditions are lacking it is usually best to defer sowing until July or August. As growth of established lettuce crops is slow in most districts in May, the plants should be kept weed free and the soil between the rows should not be packed excessively by treading on it.

When plants are being set out a sheltered site with a northern aspect where the soil has been well cultivated and manured is desirable. If drainage is poor or the ground likely to be rather cold, young plants should be set out on a raised bed.

Like most salad crops lettuce should be grown quickly. At this time of the year, when in most districts conditions are not good for growth, a light, sandy loam rich in well rotted organic matter such as farmyard manure or compost is desirable for growing plants in or for setting them out.

[*Green and Hahn*

Garden refuse should be composted or dug in unless it is too woody to rot readily or it is infected with long-lived diseases or infested with active pests.

DEAD - but they won't lie down

This is the famous "graveyard" at Dehra Dun, India where the supreme reliability of copper/chrome/arsenate timber preservatives has been proved over more than 20 years. The test poles were installed in 1936 under tropical conditions where they had to withstand Termites (white ants) as well as the familiar decays, soft rots and insect grubs. They are still 100% sound. In England 18-year tests carried out by Forest Products Research Laboratory (DSIR) confirm these findings (see F.P. Bulletin No. 32/1954).

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Cabbage for spring use can be set out in May.

Varieties

Good varieties for setting out in May include Imperial 615 (Neapolitan Winter), Imperial D, Imperial 101, and Triumph.

Potatoes

Potato crops should be mature by the beginning of May, and digging should not be deferred longer than necessary, as the tubers, particularly in wet or poorly drained soils, are liable to injury by pests and diseases. Potatoes should be clean and free from injury and disease before they are put in storage. They store well in bags, bins, or boxes in cool conditions where there is some, but not excessive, moisture. Air circulation should be good.

Spinach

Spinach is one of the few vegetables that can be sown in May, even in the colder districts, though the soil must be well drained. In favourable conditions spinach is quick growing, maturing in from about 40 to 55 days.

Spinach is hardy when established under cool conditions and can be sown throughout winter in well drained and well cultivated soil that is not too heavy, provided the seedlings can establish themselves without being "lifted" by frost. It will grow at temperatures only slightly above freezing, though the optimum growth temperature is somewhat higher. Though seed germinates at relatively low temperatures (40 degrees F or even lower), seedling emergence is usually delayed where there is frequent heavy rain. Germination is good at 50 to 60 degrees F, but the percentage decreases at higher temperatures.

Spinach thrives in cool conditions on a great range of moist, fertile, well cultivated, and well drained soils. It is not tolerant of high soil acidity, and lime should be applied to most soils that have not been recently dressed, though too much lime may cause yellowing of the leaves because of a deficiency or unbalance of certain essential elements, such as manganese or iron.

Fertilisers

A good dressing of organic material such as well rotted farmyard manure or compost is advisable on most garden soils, and as spinach is a leafy vegetable, extra applications of nitrogen may be supplied by liquid manure or a side dressing of nitrate of soda or sulphate of ammonia raked in along the line of the row, but it should not touch the foliage. Liquid manure is preferable in dry conditions, as abundant moisture is essential for high yields and good quality; growth should be reasonably quick, as otherwise some varieties tend to be tough.

Seed should be sown thinly ½ to 1 in. deep in rows 12 in. apart. Plants can be thinned to four or five to 1 ft of row, though if seed is sown thinly, thinning in the accepted sense is not essential unless conditions are dry or the soil is very poor; it can be confined to the removal of the young plants when large enough for use. In poor soil or in dry conditions crops that have been given generous spacing in the seedling stage usually "stand" much longer.

Varieties

Varieties of spinach are available with either smooth or savoy-type (crumpled) leaves, but spinach is usually sold as either prickly seeded or round seeded.

Prickly seeded spinach is usually sold for winter use, as it is generally considered to be hardier than the round seeded. Because it is considered by many to be long standing, it is also very popular for summer use. This belief in the superiority of prickly seeded spinach is not supported by the evidence of trials of different varieties of the two kinds, as it has been demonstrated that there are long- and short-standing varieties of both round and prickly seeded spinach; either may be smooth or savoy leafed.

The virus disease mosaic sometimes reduces yield, and resistant varieties have been developed overseas, though they do not appear to be available in New Zealand. Good varieties available locally include Hybrid No. 7, Prickly Supreme, and Prickly Winter Longstanding.

Tomatoes

Any remaining tomato plants should now be pulled up and can usually be put on the compost heap. They should be chopped up first, but where stem borer caterpillars have been troublesome and the chrysalises of the looper caterpillar are present the stems are best burnt. If suitable material is available for making a very efficient compost heap, where the heat rises rapidly and remains for a time at a high enough temperature to kill the pests, tomato plants can be composted.

Only very short storage of nearly mature tomato fruits is possible in the home garden. Nearly mature, well coloured fruit can be ripened successfully if subjected to fairly warm conditions where there is sufficient moisture to prevent flesh collapse and where hygiene is strict.

Slugs and Snails

The dampness of the ground usual in late autumn and winter suits creatures such as slugs and snails which may be very damaging to cabbages, cauliflowers, lettuces, and seedlings. There are several species of slugs and snails, though slugs are more common than snails and are present in practically all home gardens.

Slugs and snails feed at night or early in the morning. Moisture is necessary for them and they shun sunlight and dry air. They shelter during the day in any place that is cool, dark, and moist. Their nocturnal habits and their ability to excrete a slime which assists them in crawling and also enables them to get rid of any irritating substance with which they may come in contact make them very difficult to control.

Species differ somewhat in their eating habits. Some feed mainly on the stems and leaves well above the ground and others feed chiefly at ground level or tunnel into the bases of plants, roots, or tubers well below ground level. They are voracious and have biting mouth parts with which they eat holes in plant tissue or eat the edges of it. The eggs of most species are easily recognised, being rounded, jelly like, and translucent.

Control

The best control for slugs and snails is a bait of 1 oz of metaldehyde mixed with 3 to 4 lb of bran or similar feeding stuff and broadcast thinly or placed in small heaps about 12 in. apart over infested areas on a mild evening when the soil is damp. Bait left in heaps should be covered with material such as small pieces of wood to protect it from birds and prevent rain reducing its efficacy; if so protected, it will remain effective for weeks.

Copper sulphate has also proved effective as a contact poison, though it is injurious to the foliage of many plants. Copper sulphate crystals should be dehydrated by heating them until they are finely powdered and almost white, and then this powder mixed with about nine times its weight of hydrated lime. The mixture should be broadcast on a mild evening on the area frequented by the slugs or snails. Alternatively finely powdered copper sulphate can be mixed with equal parts of lime or fertiliser and broadcast thinly.

New Zealand Representation at 8th International Grassland Congress

RESEARCH, extension, advisory, agricultural education, and farmer interests are widely represented in the strong official delegation that is to represent New Zealand at the 8th International Grassland Congress to be held at Reading, England, from 11 to 21 July 1960. The New Zealand Grassland Association was host to the previous congress held at Massey Agricultural College in 1956 and has provided financial assistance for attendance of some delegates to the 8th congress. Dr P. D. Sears, Director of the Grasslands Division, Department of Scientific and Industrial Research, Palmerston North, who is president this year of the New Zealand Grassland Association, will lead the delegation, which comprises the following:

From the Department of Agriculture:

Dr C. P. McMeekan, Superintendent, Ruakura Animal Research Station, Hamilton.

*Mr I. L. Elliott, Superintendent, Rukuhia Soil Research Station, Hamilton.

Mr W. R. Lobb, Superintendent, Winchmore Irrigation Research Station, Ashburton.

Mr D. W. Caldwell, Livestock Superintendent, Department of Agriculture, Auckland.

Mr I. J. Inkster, Scientific Officer, Ruakura Animal Research Station, Hamilton.

*Mr B. T. Jordan, Farm Advisory Officer, Department of Agriculture, Dargaville.

From the Department of Scientific and Industrial Research:

Dr P. D. Sears.

Dr A. T. Johns, Director, Plant Chemistry Division, Palmerston North.

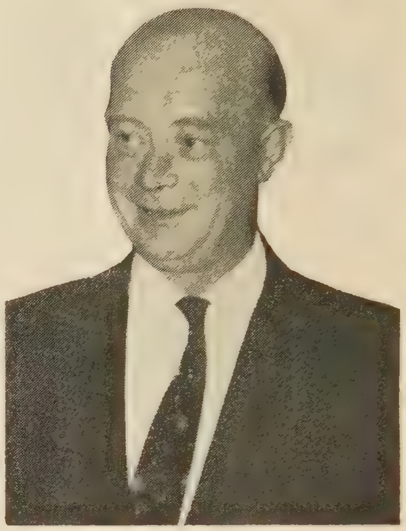
*Dr P. C. Barclay, Principal Scientific Officer, Grasslands Division, Palmerston North.

*Mr F. E. T. Suckling, Senior Scientific Officer, Grasslands Division, Palmerston North.

Mr C. S. W. Reid, Senior Scientific Officer, Plant Chemistry Division, Palmerston North (now studying in England).

From the Agricultural Colleges:

* Mr C. E. Iversen, Reader in Agronomy, Canterbury Agricultural College.



Dr Sears.

*Mr G. S. Robinson, Senior Lecturer in Soils and Field Husbandry, Massey Agricultural College.

Other Delegates

*Mr H. Woodyear-Smith, Technical Fields Adviser, Challenge Phosphate Co., Auckland.

Professor J. W. Calder (formerly Assistant Director and Professor of Agricultural Botany, Canterbury Agricultural College, now a temporary resident in England).

Mr H. R. Evans, Farm Advisory Officer (Economics), Department of Agriculture, Ashburton.

Mr T. R. Ellett, farmer, Mangere, Auckland.

Mr R. H. Kerr, farmer, Salisbury, Timaru.

Mr D. K. MacKenzie, "Strathmore", Ashburton (visiting United Kingdom on a Nuffield Foundation Scholarship).

Mr A. W. Pantall, Field Adviser, South Taranaki Farm Improvement Club.

Mr J. O. H. Tripp, farmer, Dunkery Downs, Outram, Otago.

Mr Platt Gow, farmer, Whakatane.

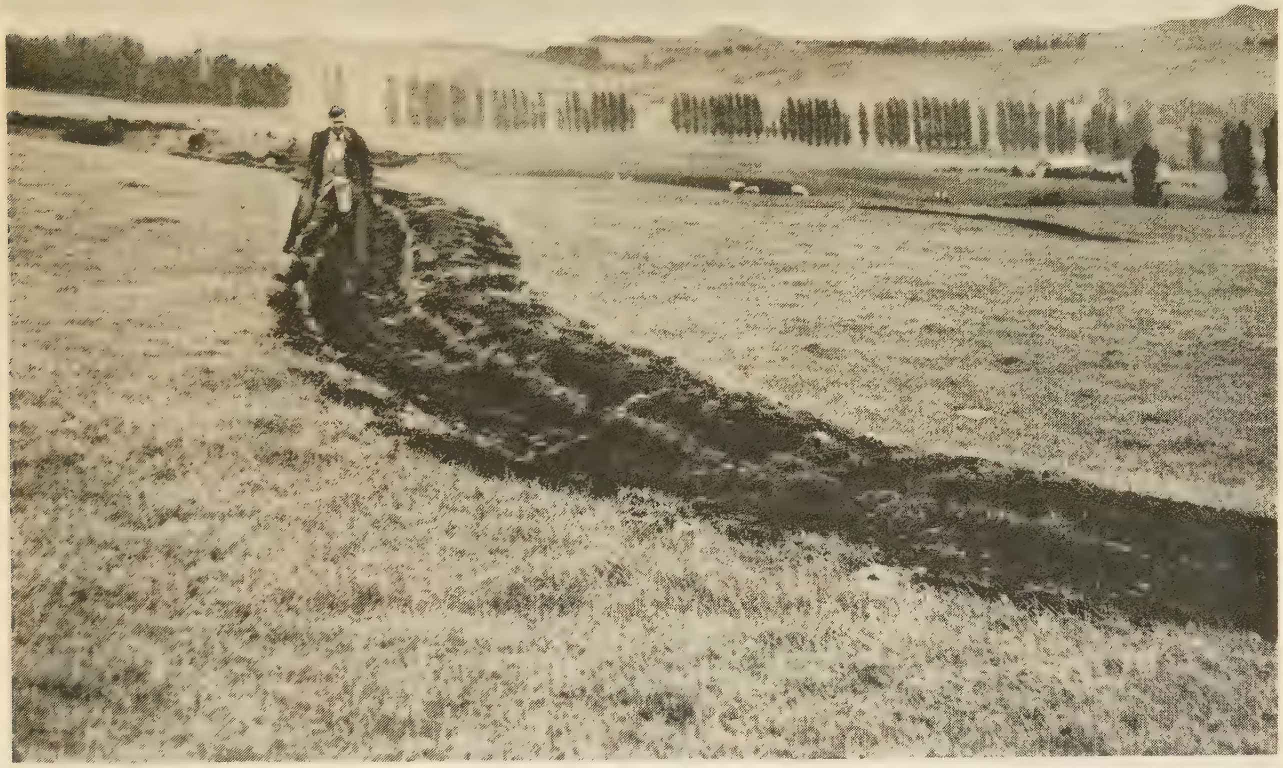
Mr J. C. Hepburn, Senior Farm Appraiser, State Advances Corporation, Hamilton.

Mr H. R. Scott, farmer, Ashburton.

* With financial assistance from the New Zealand Grassland Association.

Graded Banks for Disposal of Surplus Run-off Water

By J. R. BARTLEET,
Farm Advisory Officer
(Soil Conservation),
Department of Agriculture,
Whangarei



A graded bank made with the Chattin ditcher.

UNCONTROLLED run-off, particularly during heavy rain, can cause erosion of varying types and severity on sloping land, resulting in a loss of topsoil by sheet erosion and rilling. It frequently causes the lower and flatter slopes to remain unduly wet for long periods, while the upper slopes dry out rapidly, so that during several months of the year they suffer from a lack of moisture. This article discusses the use of graded banks to reduce such erosion, hold the water longer on the drier slopes, and divert it from areas subject to waterlogging.

DURING the past few years, the soil conservation staff of the Department of Agriculture has been experimenting with various methods of intercepting run-off water on sloping land and safely leading it to either a natural watercourse or to an artificially made grassed waterway. The principle used has been the interception of the water at regular intervals down the slope, and either holding as much as possible on the slope if it is a dry one and would benefit from a prolonged soaking, or, if the water is not required, leading it away in a graded structure to a safe outlet.

This breaks up a slope into a number of separate compartments so that during rainfall the run-off is no longer able to pour unchecked down the hillside from top to bottom, but instead each section receives only the moisture falling directly on it and not the accumulation from the slope above, with the possible exception of seepage water. It is this surface run-off which, when allowed to concentrate, contributes to sheet erosion, removing the fine particles of surface soil already dislodged by the action of raindrops, particularly on ground under cultivation or where the grass cover is poor.

Graded Banks

The structures which have proved most efficient for intercepting and disposing of surplus run-off are known as graded banks. Simply and cheaply made, a graded bank is a smooth mound of soil placed on a predetermined grade across a slope, the wide and shallow depression formed during construction of the bank being the

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channel which carries the flow of water. This channel may be 8 in. deep in the centre and 3 ft wide, and the bank itself also 3 ft wide, with a smoothly rounded top so that it can be crossed by machinery if necessary. The whole structure is grass covered.

The grade is surveyed before construction and either kept uniform throughout the length of the bank or increased toward the bank's outlet to speed removal of the water. Above all, the grade must not be so steep that the channel will be scoured.

In practice, grades ranging from 1 in 80 to 1 in 200 are used, according to the soil type, rainfall, and purpose for which the banks are required. It may be desirable to retain moisture on the slope as long as possible to increase the time for infiltration, in which case the grade used is very slight, being just enough to dispose of the surplus water. This would apply in low rainfall areas, where contour banks having no grade at all are sometimes used. Then again, maximum fall is given where disposal of the water is the prime consideration, as in parts of Northland, particularly on clay gumland soils. Sometimes it is possible to pick up water from a shady, wet face and discharge it on to a hard, dry face which would benefit from a prolonged soaking.

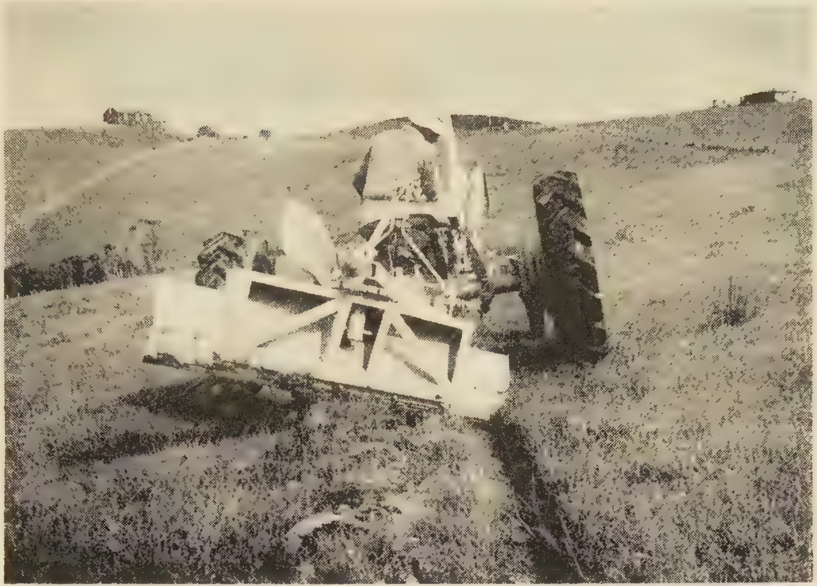
Also, where a road culvert discharges directly into a paddock it frequently forms a channel through the pasture, and the steady flow of water during and after rain causes an area to become waterlogged and encourages the growth of rushes. It has been demonstrated that the flow from a culvert can be picked up by a graded bank at the road fence and led safely away before any damage is caused.

Graded banks could also be used to tap flows from springs and possibly as outlets for mole drains.

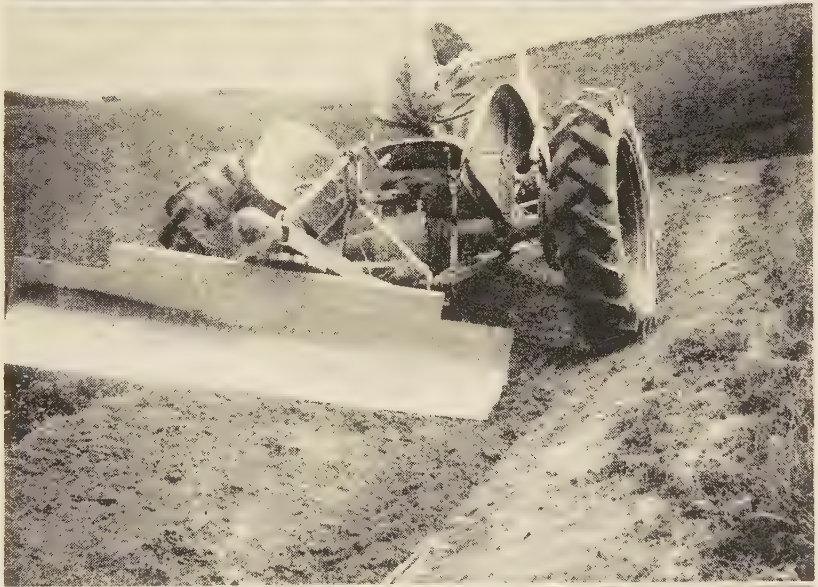
Diversion Banks

Sometimes an area of relatively flat ground suffers from waterlogging due to the run-off from a steep hillside immediately above it. If the flat is cultivated, soil may be lost during heavy rain. To divert the water from the flat a diversion bank may be con-

GRADED BANKS DISPOSE OF SURPLUS WATER

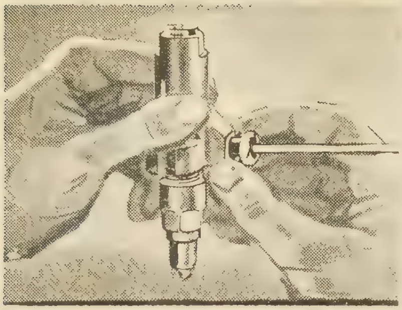


Making the opening cut along → the surveyed line with the toe of the blade.



On completion the bank is → smoothed off with the back of the blade and then consolidated with the tractor wheel.

Looking down a grassed water- → way with graded banks leading into it from either side.



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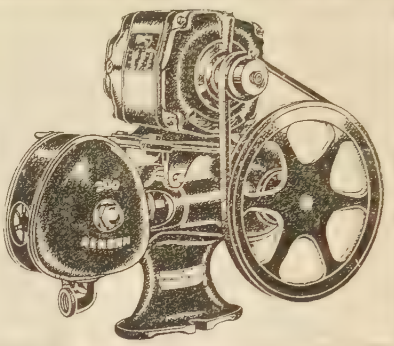

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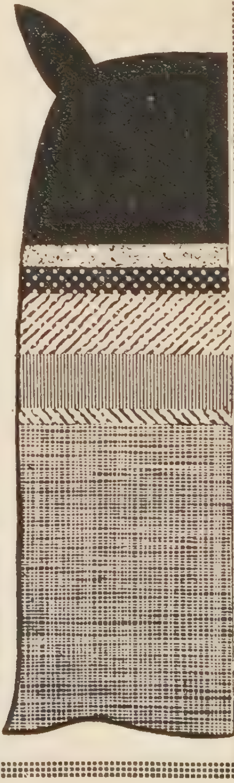


structed at the foot of the hill. When such banks are designed the size of th catchment area, its vegetation and soil type, the slope, and expected rainfall intensity must all be considered so that a bank of adequate capacity can be formed, as an overflow from an inadequate bank could cause damage.

On the other hand, it is seldom practicable to design a system of graded banks that will cope with the heaviest rainstorms, but provided the banks have been well consolidated and grassed, overtopping for short periods will cause little or no harm.

Construction

Advice on the planning of a system of graded banks is available from the soil conservation staffs of catchment boards and the Department of Agriculture, who are usually able to do the necessary survey work and supervise construction and in a few districts are also equipped to do the whole job.

Probably the most readily available implement for the work for most farmers is a rear-mounted grader blade fitted to the hydraulic system of a wheel tractor. The blade should be readily adjustable both for the angle of cut and the angle at which it is tilted down to the ground. Satisfactory results can be obtained in a grassed paddock when conditions are suitable, preferably in autumn after there has been enough rain to make the soil moist and workable. Also at this time of the year a good take of grass can be expected when the banks are sown after completion.

The first cut along the surveyed line is made with the point of the blade to break the ground and give a guide line on which to work. This line is the centre of the ultimate channel where the water will flow. The next cut brings soil down into this channel from the uphill side, and on the return trip it is removed from the channel and deposited to form a bank on the downhill side. Depending on the nature of the ground and skill of the operator, up to a dozen cuts may be necessary to form a bank of suitable proportions, and the time taken for construction may be up to 10 or 12 minutes per chain of bank. The bank is then consolidated with the tractor wheel.

Better still for construction is an implement that was specially imported for trial from the United States of America known as the Chattin double wing ditcher. Used behind a crawler tractor, this implement can form an ideal bank in two or three cuts.

Disposal of Water

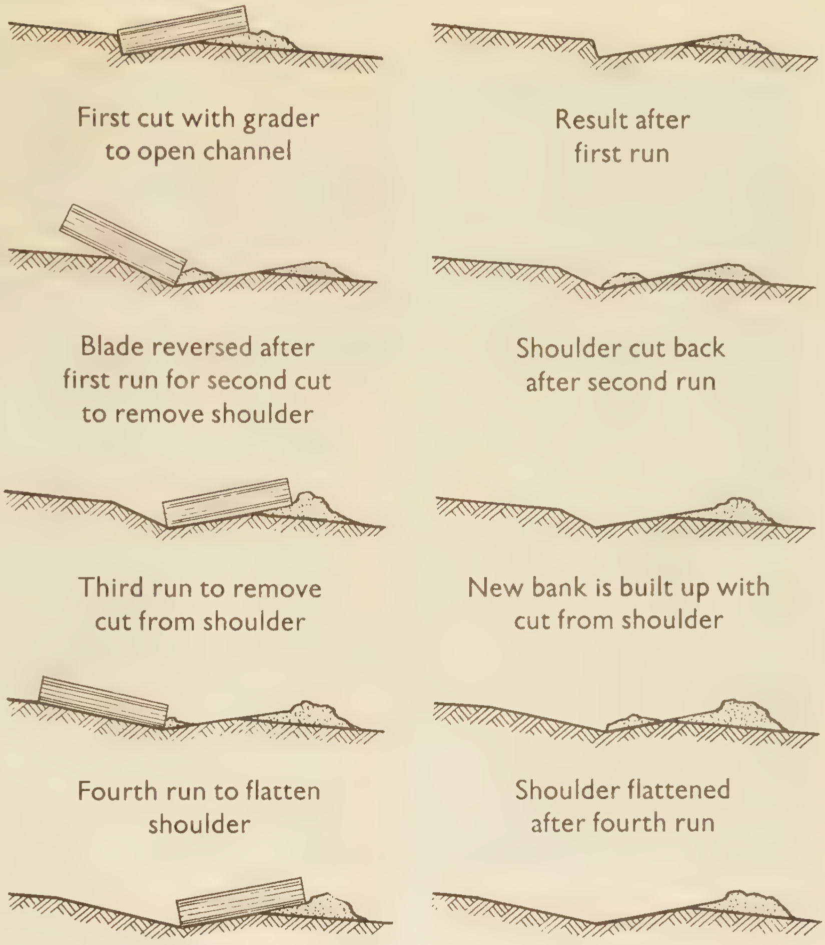
Outflows from graded banks may be discharged into a natural watercourse if one is conveniently situated, care being taken that the extra water it will have to carry does not lead to gullying. A wise precaution would be to plant pairs of poplars or willows down the watercourse a year or two in advance. Alternatively the banks may be emptied on to ridges where the water can spread out and get away safely, or into dams or stock ponds.

Where none of these methods is feasible it will probably be necessary to make an artificial or grassed waterway. The graded banks will then discharge their flows into this waterway, which in turn will lead to the safe disposal point. Such waterways may be 15 to 30 ft wide and are almost flat in cross-section or very slightly dished in the centre. This is to ensure that the water is spread out with no risk of scouring.

The area for the waterway must first be cultivated so that it can be graded to the required shape. It is then sown down to grass, given a liberal dressing of fertiliser, and a strong turf established before any water is led on to it. For large waterways it would be worth while hiring a road grader for the job.

Sometimes it is better for the turf of a waterway to be protected from damage by stock by fencing it off and grazing or mowing it only occasionally. The dangers of overgrazing and pugging, resulting in opening up of the turf and scouring, are thus eliminated.

Results to date on a number of farms are promising and it has been demonstrated that graded banks are important for controlling soil loss and disposing of surplus water before it can accumulate and cause damage. Banks have been constructed on slopes of up to 15 degrees and trials are being continued to test their effectiveness for different uses under different conditions.



GRADED BANKS DISPOSE OF SURPLUS WATER

First cut with grader to open channel

Result after first run

Blade reversed after first run for second cut to remove shoulder

Shoulder cut back after second run

Third run to remove cut from shoulder

New bank is built up with cut from shoulder

Fourth run to flatten shoulder

Shoulder flattened after fourth run

Fifth run to remove cut from fourth run

New bank completed except for compaction

Sequence of cuts needed to make a graded bank.

Safe, Simple Cattle-dehorning Bail

By R. G. GILL,

Livestock Instructor, Department of Agriculture,
Levin

ON every farm carrying cattle there should be a bail that can be used for dehorning, earmarking, and other operations. Many types, efficient and otherwise, are in use at present in New Zealand. One seen recently on Mr J. W. Barber's property near Foxton is worth special mention. Mr Barber has been raising cattle successfully on sand-covered peat near Foxton for over 30 years.

EFFICIENCY, simplicity, and cheap construction are features of Mr Barber's bail, three of which are in operation so far.

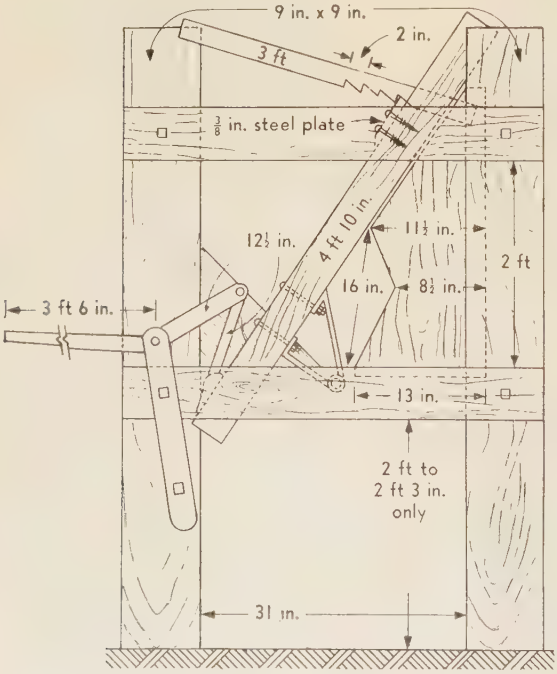
His bail is automatically self-adapting and can take any sized beast of any age without prior adjustment. A one-handed downward movement of the operating lever closes it. A ratchet at the top of the bail holds the animal and this has to be disengaged (by lifting upward) before the animal can be released.

The first bails made were of wood, a heavy block to hold the neck being cut out of a piece of macrocarpa 13 x 4 x 36 in. long. The piece remaining after cutting was used on the opposite side of the bail to act as a stop to prevent animals putting their forelegs through, thus minimising the chances of injury. Hardwood crossbars were set into the corner posts.

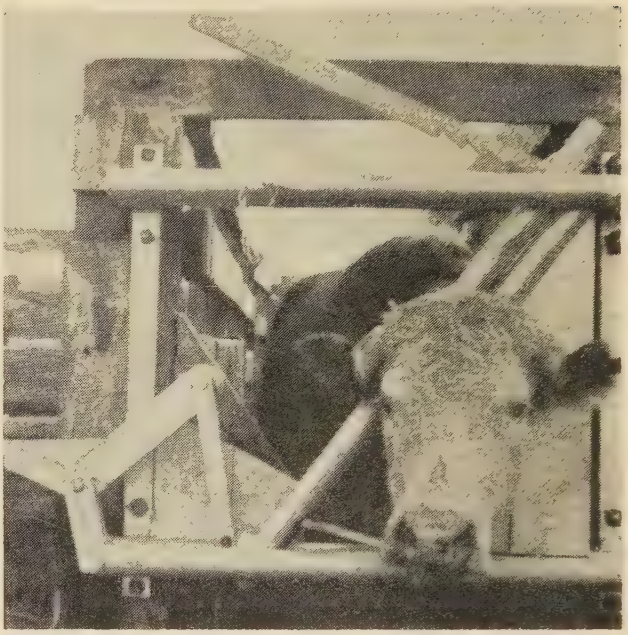
Mr Barber has recently made a similar bail in steel, which, though costing more, is more durable and better looking.

To allow bailing up of animals of any age the bottom crossbar should be between 24 and 27 in. from the ground.

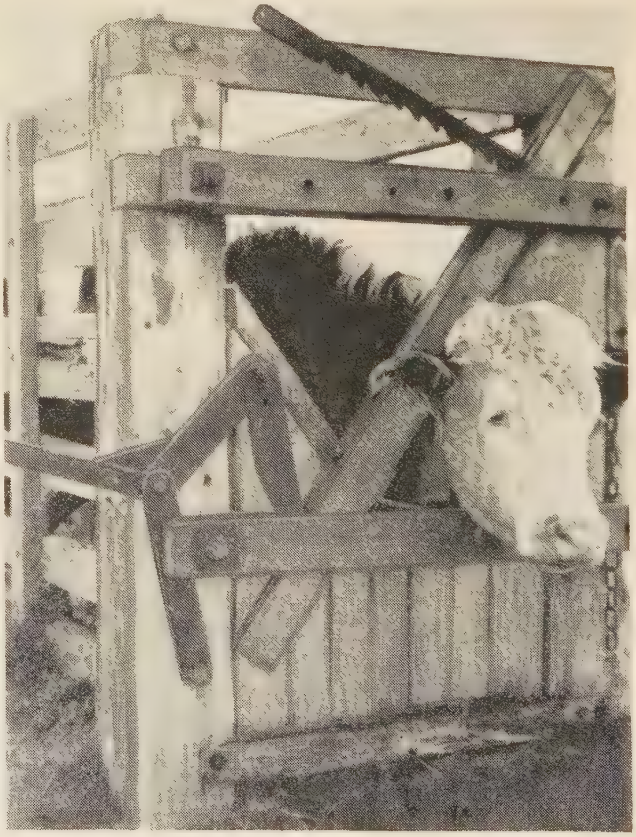
The bail is easily dismantled and reassembled.



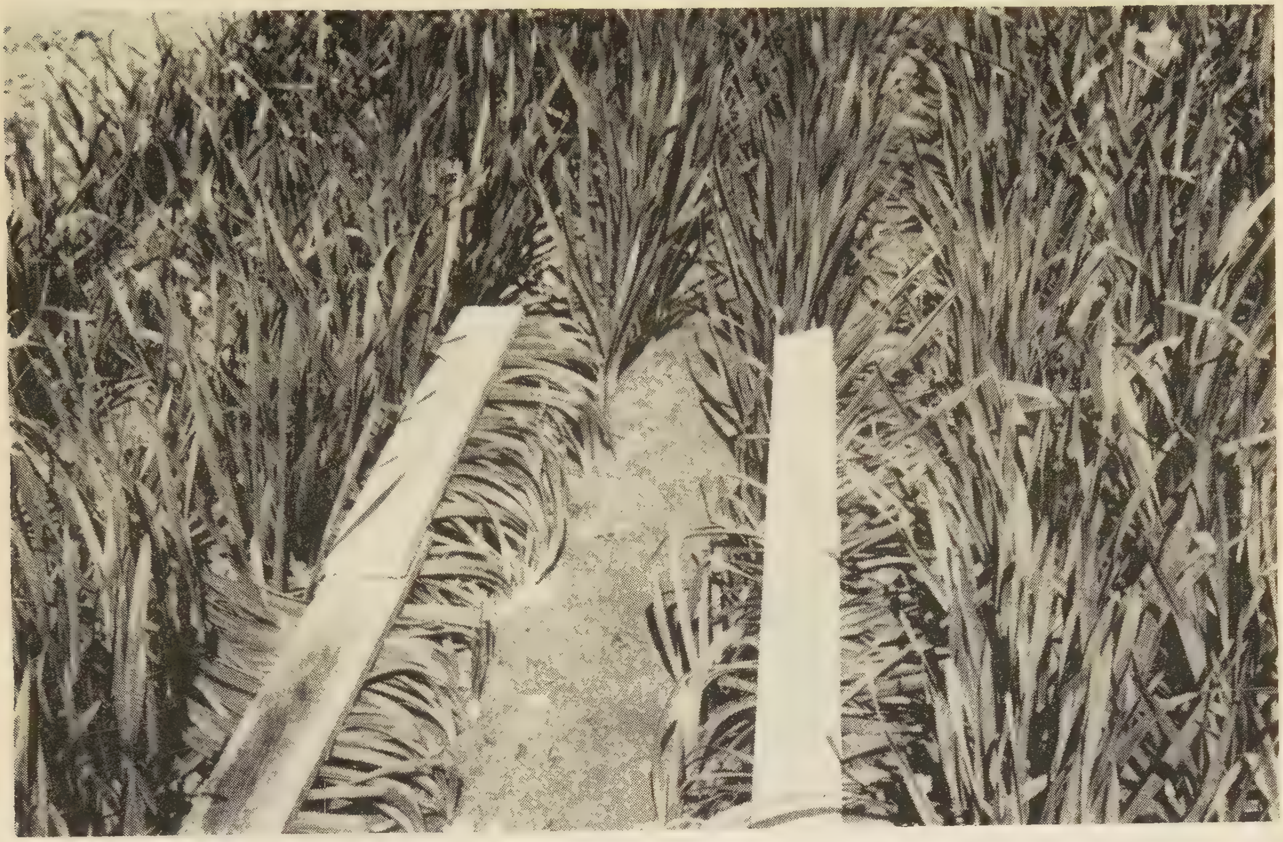
Construction details of wooden bail.



▲ The steel bail, though more expensive, is more durable and better looking than the wooden bail. ▼



Chemical Weed Control in Bulbs



Weed control in narcissus with monuron 2 lb per acre applied to weed-free soil in April when bulb tips were just emerging. Photographed in mid September; silt soil, Lower Hutt.

By J. P. SALINGER,
Horticultural Advisory Officer (Ornamentals),
Department of Agriculture, Wellington

THE use of chemical weedkillers by bulb growers is increasing in all parts of the world. In New Zealand a limited number of experiments have been carried out and growers are themselves testing various materials. This article summarises experience gained to date with various methods of weed control in bulbs.

ONE of the most expensive operations in bulb growing is the control of weeds. The majority of bulbous plants grow above the soil during winter and flower in spring so that control of weeds by cultivation is often difficult owing to wet weather. In addition some bulb crops such as tulips and anemones may be damaged and allow the entry of disease if the foliage is injured during the growing season. The use of suitable chemical weedkillers therefore offers great possibilities to the bulb grower.

No one material is suitable for all bulbs, as their growth is different; for instance, anemones are planted shallow and have spreading foliage while lilies are planted more deeply and have upright stems. Some bulbs, such as hyacinths, are lifted and replanted annually, whereas bulbs like narcissus may be left in the same area for several years. However, consideration of the various materials, methods of culture, and weeds present will enable bulb growers to chose the most suitable treatment.

Generally, the use of weedkillers will not eliminate the need for cultivation during part of the season. Few of them will control perennial weeds satisfactorily, and on many soils a completely weed-free surface during the whole of the season would cause the soil to pan down and perhaps crack in dry weather. The main need for weedkillers is to control weeds from the time of the emergence of the bulb shoots until after plants have flowered, though with established plantings of narcissus general weed and foliage destruction at the end of the growing season is desirable.

Cultivation

Some growers obtain adequate weed control by suitable cultivation, especially with tulips and gladioli. The usual method is to plant the bulbs or corms in drills and mould up the rows of plants as they emerge and before they flower.

Similarly where bulbs are grown in beds a dressing of coarse sawdust up to 1 in. thick can be applied over the whole bed when the soil is moist and open; additional nitrogenous fertiliser is usually needed when sawdust is used. Preferably the sawdust should come direct from mills cutting trees into timber, as there is then little

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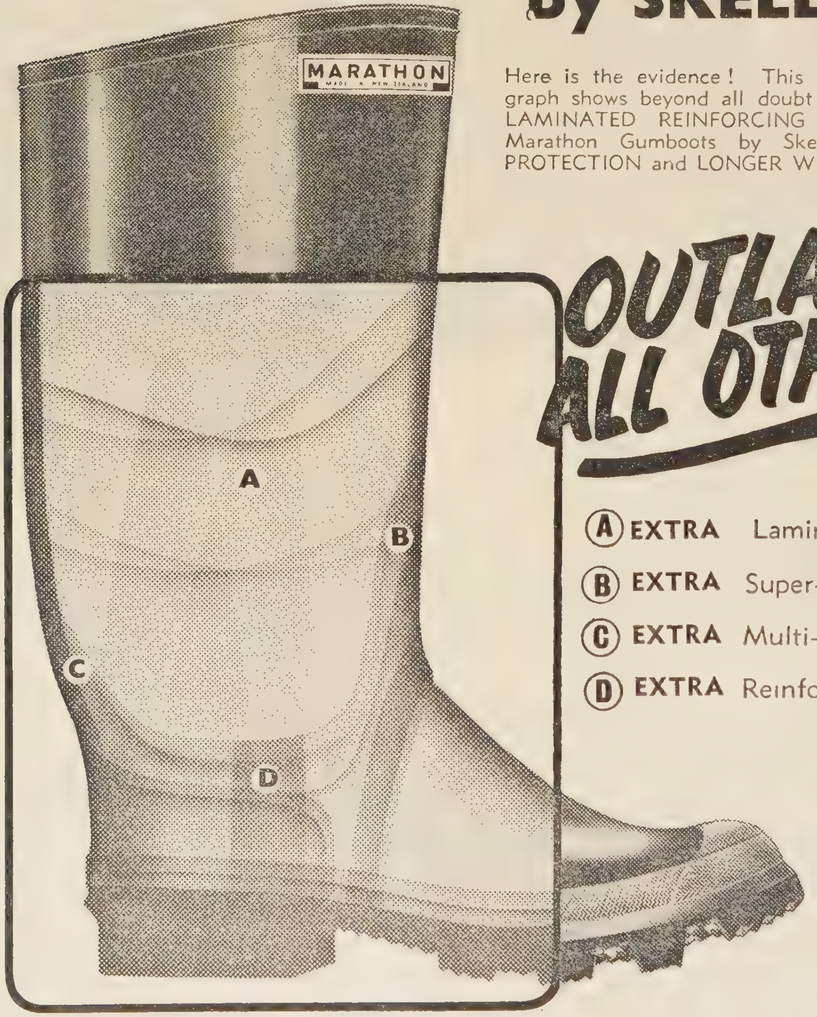

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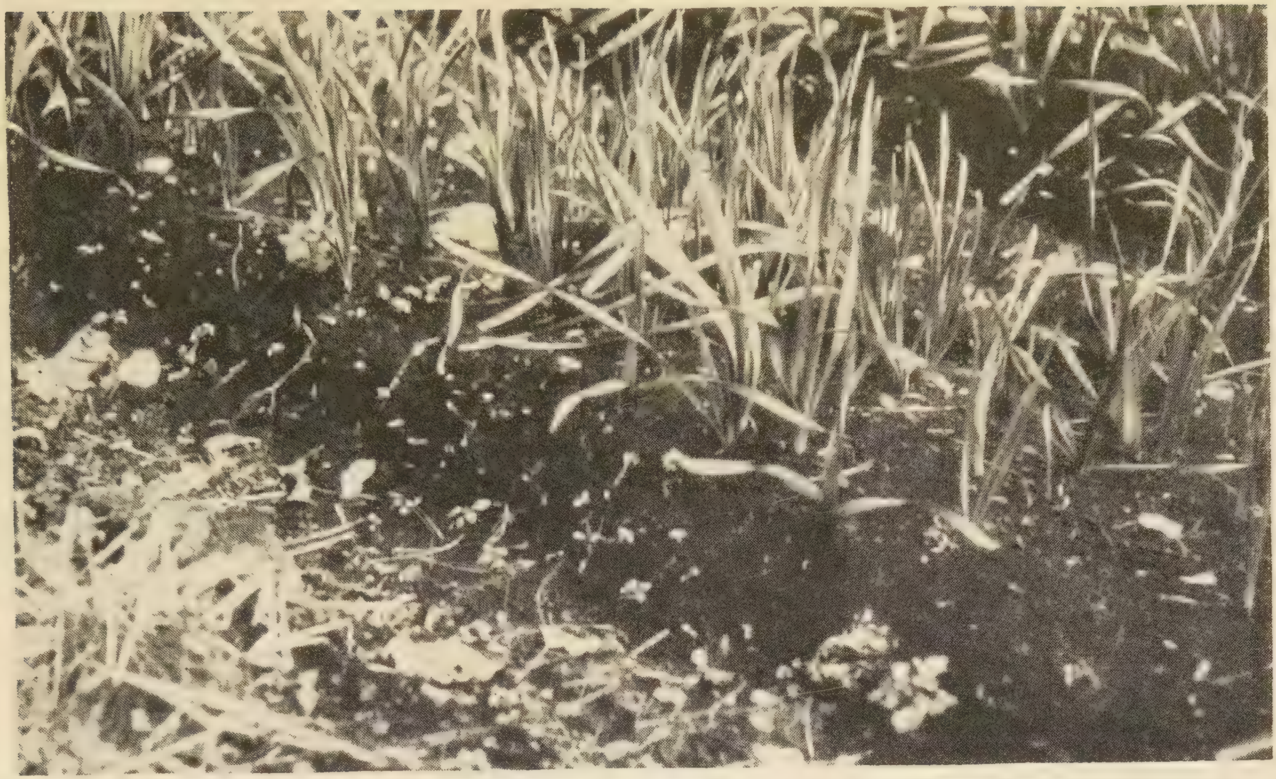

Weed control in narcissus with PCP 16 lb and diesel oil 33 gallons per acre applied to weed-covered ground in February. Bulbs had not emerged. Unsprayed weed growth in the foreground. Photographed at the end of April; sandy soil, Wanganui.

danger of the wood having been treated with timber preservatives harmful to plants and the sawdust is more coarse and open. Even where sawdust is used weeds will gradually grow through it, and if it is covering permanent crops, it may be worth spraying the sawdust with a suitable weedkiller before the bulbs emerge in the second season.

Materials for Weed Control

Three types of materials can be used for weed control:

1. Soil sterilants before planting.
2. Contact weedkillers after planting and before emergence of bulbs.
3. Seed germinant weedkillers after planting and also after emergence of bulbs.

Soil Sterilants

The development of non-persistent volatile soil sterilants has opened up a new aspect of weed control. Methyl bromide and vapam particularly appear promising for controlling weeds before bulbs are planted. Their main use will be with small bulbs such as *Habranthus* and *Zephyranthes* or gladiolus cormlets, where a large number of bulbs are grown in a small area.

Methyl bromide would be used normally to treat the soil prepared for planting and is most conveniently applied from 1 lb canisters, the gas being injected under an airtight plastic sheet at 1 lb to 100 sq. ft. Full instructions for its use and the precautions to take are supplied with the canisters. In warm weather methyl bromide will normally volatilise satisfactorily, but when soil is being treated in late winter or early spring when air and soil temperatures are below 50 degrees F the user is recommended to place the canister in a pail of hot water (about 130 degrees F but not higher than 185 degrees) for a few minutes. After fumigation and removal of the plastic sheet the ground should be lightly worked and left exposed for a week before bulbs are planted.

Control of Couch

Couch or twitch is one of the most troublesome weeds in established plantings of bulbs such as narcissus. The material TCA, which is often used to control couch in bare ground, should definitely not be used among bulbs. Some control can be obtained by spraying the leaves of couch with dalapon at 10 lb per acre in summer when no bulb foliage is above the ground. This treatment followed by a contact weedkilling spray in autumn will reduce the growth of this weed, though it will not eradicate heavy infestations.

As vapam is used as a soil drench it has some limitations. It can be used to treat the whole of a small area or could be applied along the planting drills before planting. The normal recommended rate is 1 gallon to 44 sq. yd., but experience in Auckland has shown that only partial weed control is obtained at that strength.

When vapam is applied the concentrated material should be diluted to give 1 part in 8 parts of water. This is followed by a water seal equivalent to 4 gallons to the square yard. In cooler weather, planting should be delayed until a fortnight or more after application and the treated area should be lightly cultivated two or three days before planting.

Contact Weedkillers

Contact weedkillers can be used after larger bulbs have been planted but before the growing points emerge from the soil. The bulbs should have been planted at least 2 in. beneath the soil surface. These weedkillers are used to control small weed seedlings which germinate before the bulbs emerge.

Previously dinitro materials, usually mixed with diesel fuel and water, were used, but bulb growers are now finding that PCP (pentachlorophenol) mixed with diesel fuel oil is particularly effective. Overseas growers have successfully used PCP emulsified with water at 8 to 12 gallons per acre, applying about 100 gallons of spray mixture per acre to control weeds in winter. One bulb grower in Wanganui has had best results by dissolving 1½ lb of PCP in 3 gallons of diesel fuel oil and applying this mixture at 33 gallons of spray to the acre; this has given adequate and persistent weed control in anemones and narcissus after planting.

Proprietary formulations based on PCP are also available. They should be used before the tips of the bulbs break the soil surface.

The same mixture can be sprayed over a long-standing sawdust mulch to control weeds which have grown through before bulb tip emergence and can also be used for general weed control on uncropped land. It is possible that it would be suitable also for drying off and killing weeds in permanent plantings of bulbs at the end of the growing season.

Diesel fuel oil, kerosene, and proprietary oil-based sprays as used in conifer seedbeds will also kill small weed seedlings, but will not give such persistent control. Rates of use depend on the percentage of aromatic oils in the spray material.

Weed Control in Specific Bulbs

Plant	Material	Time of treatment
Anemone	PCP	Immediately after planting and definitely before emergence
Bulbs, small, and seedlings	Methyl bromide	Soil fumigated before planting
Freesia	(a) Methyl bromide (b) CIPC 3 pints per acre	Soil fumigated before planting seeds or corms Plants 2-4 in. high. Seeds must be covered with ¾ in. of soil. (Dutch recommendation)
Gladiolus	(a) PCP (b) CIPC 1 gallon per acre (c) Monuron 2 lb per acre (d) PCP and monuron or CIPC	Pre-emergence Pre-emergence and post-emergence Pre-emergence and post-emergence Pre-emergence Post-emergence
Hyacinths	(a) PCP (b) Monuron 2 lb per acre (c) CIPC 1 gallon per acre	Pre-emergence Pre-emergence (bare soil) Pre-emergence (bare soil)
Iris (bulbous)	(a) PCP (b) CIPC 6 pints per acre	Pre-emergence Pre-emergence and post-emergence
Lilies	Sawdust mulch Mulch may be sprayed with PCP before emergence of the lily shoots in the following season.	After planting
Narcissus	(a) PCP (b) Monuron 2 lb per acre	Pre-emergence Just before or at emergence.
Tulips	(a) PCP (b) CIPC 1 gallon per acre	Pre-emergence Pre-emergence

The effectiveness and safety of these treatments will depend on the care taken when spraying and on subsequent weather.

Before spraying large areas of bulbs growers should test the materials on a small area for one season. In particular the sprayer should be tested over a measured area so that the correct quantity of weedkiller is applied.

Seed Germinant Weedkillers

Seed germinant weedkillers have proved to be most satisfactory in controlling weeds from seed. The substituted-urea compound monuron is regularly used by some narcissus growers in the North Island and CIPC has also proved satisfactory.

The choice of materials depends on the annual weeds likely to be present and the weather. Where annual meadow grass (*Poa annua*) is a serious problem CIPC will probably provide the best control, especially in cool, moist weather. Monuron at 2 lb of active ingredient per acre has given very good and persistent weed control on silty soils when applied before the emergence of the tips of the bulbs above the soil surface. CIPC and monuron may be safely combined to give complete control of a range of weeds from seed.

Both monuron and CIPC may be applied after the emergence of bulbs with narrow leaves, such as narcissus, iris, and gladiolus. Care should be taken that the spray does not run down the leaves to the leaf bases, especially in bulbous iris. When used in plantings of gladiolus CIPC is likely to be less effective from November onward owing to higher temperatures.

It is probable that newer materials which are being developed and tested will provide even better and more persistent weed control in bulbs.

Studied Facial Eczema Here

Examining a mobile spore collection trap at the Department of Agriculture's Ruakura Animal Research Station is Mr D. E. Hore (centre), a district veterinary officer in the Victorian Department of Agriculture. With him are Mr F. T. Lees (left), Technical Officer, and Mr J. C. Percival (right), Senior Scientific Officer, both of Ruakura. Mr Hore has been studying facial eczema research in New Zealand for the past two months; facial eczema has occurred twice recently in Victoria with considerable losses.

Silverware is expensive and the prospective purchaser needs to know something about it. Whether the choice is real silver or plated ware, a selection of good quality and design can beautify the home.

Selection and Care of Silverware

By PATRICIA M. de LAUTOUR, Home Science Instructor,
Department of Agriculture, Palmerston North

SILVER has been used domestically since the earliest times and many pieces have become very valuable because of their antiquity.

UNFORTUNATELY, owing to unsettled political conditions and the resulting civil wars and revolutions, much of our beautiful early silverware has been either sold or melted down to provide money for wars. Also, as fashions in silver followed fashions in architecture, huge quantities of exquisite silverware were melted down and "modernised", thus destroying the work of the master craftsmen whose art was at its zenith between the seventh and eleventh centuries.

Though there is very little sterling silver on the New Zealand market at present, it is well worth buying if the opportunity arises. Its value does not deteriorate and it is often possible to pick up some good pieces second hand.

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Plated Silver

E.P.N.S.

What is often casually referred to as silver is really electroplated nickel silver. This is an alloy of copper, nickel, and zinc, covered by an electrolytic process with a layer of silver. This layer is inclined to rub off with wear or rough cleaning, but can be renewed by a similar plating process.

This silver is always marked E.P.N.S., but there is no hallmark or other protecting mark with regard to its quality. Most manufacturers mark their best ware E.P.N.S. A1. It must, of course, be E.P.N.S., but the letters A1 are no indication of its quality. The E.P.N.S. B1 or even B2 grade of an article made by one manufacturer may be better than the E.P.N.S. A1 produced by another firm. Therefore, as the only safeguard is the name of the manufacturer, it is wise to choose E.P.N.S. ware that has been stamped with the name of a reputable firm.

Beware of articles stamped E.P. A1. They are usually electroplated on copper and nearly always wear through to the base metal fairly rapidly.

Good-quality electroplated silver is very satisfactory for everyday use and considerably cheaper than sterling silver, which can be collected gradually.

Britannia Metal

Another plated ware on the market is Britannia metal, a silvery-white alloy made up of 80 to 90 parts of tin, 10 to 20 parts of antimony, and sometimes small quantities of copper, zinc, lead, or bismuth. Britannia metal is "soft" and is used for hollow-ware and occasionally for trays and spoons and forks. It is definitely inferior to E.P.N.S. and is not often marked.

Hallmarks

The buyer of silver today can see at a glance, because of the hallmarks, just when and where a piece, whether modern or antique, was made, and its quality, because standards that were set up in the Middle Ages have been in use ever since to protect the purchaser.

During the reign of Edward I in the thirteenth century the Goldsmiths' Company set up a legal standard with which all articles must comply. This was known as the sterling standard and meant that the metal contained 925 parts of pure silver and 75 parts of copper. All articles up to this standard were marked with a lion's head. Later this was changed to the "lion passant", a term adopted from heraldry, showing the lion in motion. This was adopted and recognised by all assay offices. The lion's head was retained to show that the article had been assayed in London and other offices used their own marks, for example, Birmingham office was denoted by an anchor, Dublin a harp, and Edinburgh a castle.

Other marks were added from time to time; for example, the date letter to show the year of manufacture, the manufacturer's initials, and in some cases, during a certain period, the sovereign's head to show that duty had been paid. Since the eighteenth century these marks have become known as hallmarks.

Sheffield Plate

Modern electroplated ware should not be confused with Sheffield plate, which was made toward the end of the eighteenth century until the modern electrolytic process was developed. Sheffield plate was made by fusing silver on to a base of copper. Sometimes the copper was plated on both sides and sometimes just on the upper surface as with some salvers and trays. This plating was mostly used for hollow-ware and heavier pieces.

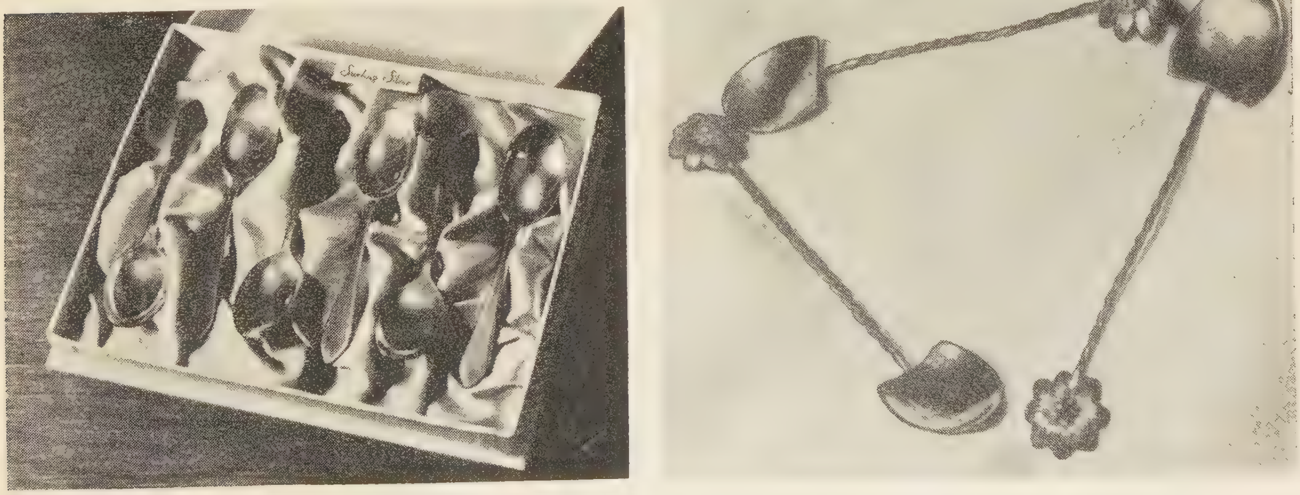
Table Silver

Before silverware is bought several points must be considered, the most important being quality and quantity, the purpose for which it is to be used, and the money available.

Table silver includes hollow-ware, cutlery, and flatware. Hollow-ware, as its name implies, includes those articles which have been hollowed out of the metal to form a receptacle, for example, teapots, coffee pots, jugs, basins, dishes, castors, and condiment sets. Flatware comprises spoons, forks, and slices. Knives are classed as cutlery when they have a sharp cutting edge and are known as slices when the blade is blunt as in butter knives and fish knives.

If good-quality ware in a standard pattern is chosen, it is simple to add

Below—A set of modern sterling silver teaspoons in an attractive simple design. Right—Antique coffee spoons with delicate hand wrought stems ending in flower-shaped tips.



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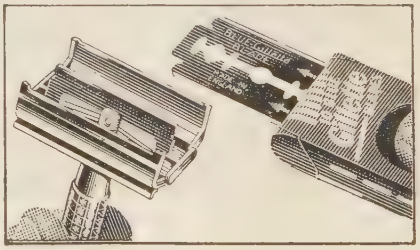
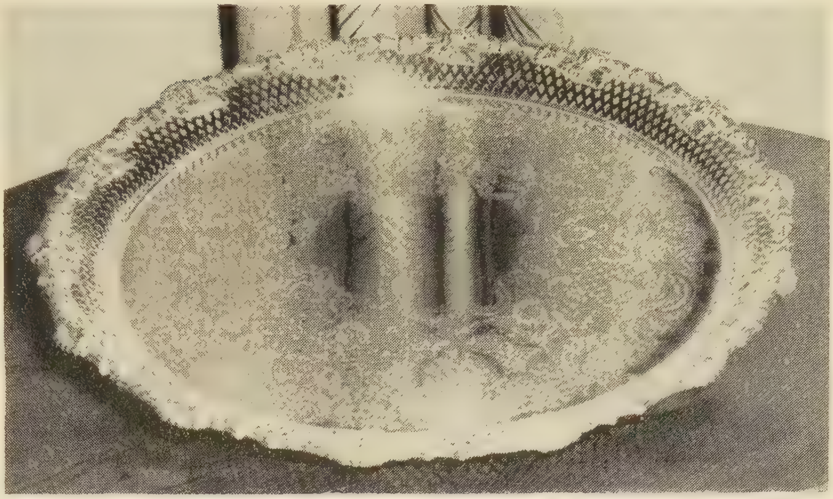
And there's a razor to get the best from it—the precision-made one-piece Gillette. Get yourself one next time you call in for blades, and start finding out how good a shave can be! One-piece Gillette razors are priced from 10/- to 85/-.



Get Blue Gillette, the world's sharpest blades in the handy quick-feed dispenser. It has a place in the back for used blades. Costs no more than the ordinary pack. **10 blades for 3/4.**

Gillette—for a good, clean, fresh shave



A silver tray adds a note of glamour and combines utility with beauty.

extra pieces. Remember to limit quantity rather than quality. Choose a standard pattern and build up your supply gradually, adding less essential but useful articles as the opportunity arises.

A suggested service for six persons is:

Stainless steel	dessert knives	6
	table knives	6
Sterling silver or electroplated silver	teaspoons	6
	dessertspoons	6
	dessert forks	6
	soup spoons	6
	table forks	6
	tablespoons	2
Stainless steel	carving fork	1
	carving knife	1

From time to time other articles can be added such as butter knives, jam spoons, egg spoons, coffee spoons, vegetable serving spoons, afternoon tea forks, fruit knives, and fish knives and forks.

A good-quality tea or coffee set is a good investment and will provide much pleasure and satisfaction.

Pricing

The pricing of silver has always posed a problem, the difficulty being to compensate for both the amount of silver in the article and the workmanship that has been put into it.

If there is too much emphasis on the amount of silver, no consideration or encouragement is given to the craftsman who can create an artistic masterpiece. Eventually a compromise was reached and now the price is based on the quality of the metal with a percentage added to pieces with considerable ornamentation such as mounting and piercing.

Electroplated ware is priced according to the quality of the plating. The highest grade, A1, costs more than a similar article marked A or B made by the same manufacturer.

Good-quality electroplated ware is usually 20 to 40 per cent cheaper than sterling silver, but this depends partly on the amount of work, such as engraving or embossing, which has been put into the article.

CARE OF SILVERWARE

It is important to take care of good-quality silverware and the best way to do this is to use it. Today, because of the shortage of household help, many people have put their good silver away in cupboards where it soon becomes tarnished.

Remember that silver can be scratched, so treat it with care, for though slight scratches will blend into a patina, deep scratches will not.

Be careful washing silver or electroplated ware. Do not wash it in hot water and then rinse it in cold, particularly with articles such as teapots, because cold water on hot metal is the principal cause of damage to the join at the junction of body and spout.

Ornamental silver should be dusted regularly and washed once a week to keep it bright.

Cleaning

Wash table silver after each meal in hot, soapy water and dry thoroughly.

Simple Care

The advice given by the great silversmith Paul Lamerie in 1737 still holds good today:

"Keep the silver in daily use and wash it in soap and water."

Clean off any stains, particularly from eggs. Never let it stand overnight. After using silverware for fish rub it with the rind of a lemon and rinse in warm water.

All articles not used at the table have to be cleaned with a commercially prepared cleaner.

There are two methods of cleaning tarnished silver: Hand rubbing with a prepared polish, liquid, paste, or powder, and electrolytic cleaning in which soda and aluminium are used. Hand rubbing is preferable as electrolytic cleaning is rather harsh and removes surface oxidation, leaving the metal dull, white, and lustreless. Though the appearance of the metal can be improved again by polishing, electrolytic cleaning is not recommended except in extreme cases.

Hand Rubbing

Hand rubbing gives a depth and lustre that are beautiful and desirable, leaving enough oxidation to bring out the beauty of the decoration. Take time to do it carefully and wear gloves to protect your hands.

Wash the silver first in hot soapsuds, then apply a reliable polish with a soft cloth, sponge, or chamois. Rub each piece briskly, but not hard, using even, straight strokes. Do not rub crosswise or with a rotary motion. A silver brush (made specially for the purpose) is useful for cleaning hard-to-reach crevices, chased surfaces, and beaded edgings.

After applying the polish rub the silver with a clean soft flannel cloth or piece of chamois until it is clean and bright.

Finally, wash each piece again carefully in hot suds to remove every trace of polish. The brush can again be used to ensure that no powder is left clinging to raised patterns. Polish left on silver will cause it to tarnish again quickly.

It should not be necessary to polish silver every time it is cleaned; the tarnish can be simply wiped off with the cleaning material.

Electrolytic Cleaning

For the electrolytic method, which should not be used unless really necessary, an old aluminium saucepan with salt and baking soda has to be used. For each quart of water one teaspoon of salt and one teaspoon of baking soda are required. Bring the water to the boil, then put in the silver, making sure that it is covered completely. Boil for two or three minutes until the tarnish has disappeared. Remove the silver, wash it in hot soapy water, rinse carefully, and dry with a soft cloth or chamois.

This process involves an electrochemical reaction by which the tarnish of silver sulphide is removed from the silver and deposited on the aluminium, hence the reason for using an old aluminium pan. If the pan itself is tarnished, the process will not work satisfactorily.

This method should not be used on flat silver with handles that may be fastened with cement, nor should it be used for antique silver or hollow-ware.

Special Finishes

Dull or satin finish silver will become bright after many polishings and dealers agree that there is no satisfactory method of restoring a satin finish at home. If the dull finish is desired, the silver must be returned to a jeweller for treatment.

Gold linings can be rubbed off very easily and should not be polished. Gold is a soft metal and the lining would soon vanish, but it can be renewed by a jeweller.

Lacquered silver does not tarnish and so requires no polishing. Wash it in lukewarm water (never hot) with mild soap and detergent. Lacquer can be re-applied by a jeweller. This silver is mainly used for large ornamental pieces.

Storing

As tarnish on silver is caused by the action of gases in the air on the surface of silver, the tarnish is diminished if air can be excluded. Cloth and paper tissues treated with silver nitrate are good for preventing tarnish, but wrapping each piece of clean, bright silver in tissue paper is almost as effective. Camphor in the cabinet or drawer where the silver is stored also helps.

Silver Plate

The care of electroplated ware is similar to that for solid silver, but because the plating is solid silver and this is softer than sterling, electroplated ware should not be polished as frequently nor as energetically. The safest way is to wipe the tarnish away with a soft cloth moistened with polish.

Silver Polish

An expensive commercial silver polish is not necessary. Fine whiting makes an excellent silver polish and has many other uses round the house.

Dampen a soft cloth with a little ammonia or denatured alcohol, dip it in whiting, and apply like any other polish.

Commercial mixtures are available as liquids, pastes, and polishes, and vary in composition, but most contain fine abrasives like whiting or rouge. Treated polishing cloths are useful, but can be messy to handle and become ineffective when coated with tarnish. Silverware should be carefully washed after using these cloths.

Avoid polishes that contain harsh abrasive such as silica and those containing cyanide, which is a deadly poison.

Precautions

Silverware has many enemies. Table salt, eggs, olives, salad dressings, sulphur gas, vinegar, fruit juices, and perfumes are all harmful. Sea air and leaking gas tarnish silver rapidly. Rubber corrodes it and should never be allowed to touch it.

The acids generated by decaying flowers, leaves, and fruit will eat into silver fruit or flower bowls and cause ugly little pit marks, so it is wise to change the water frequently.

The flowers should be taken out as soon as they begin to wilt.

Pearl, ivory, or horn handles on silver knives and forks should not be left to soak in water, as the cement fastening the handles may be loosened. No other care apart from ordinary washing is required for these handles.

Use of Refrigerators

A REFRIGERATOR differs from a safe in that it is a tightly closed box and there is not the constant flow of fresh air that there is in a safe. Because of this, strongly flavoured foods and foods such as butter and milk which readily absorb other flavours should always be kept covered.

As it is a storage place for food, the refrigerator must be kept perfectly clean and should be defrosted (unless automatic) and washed out at least once a week. To wash out either a refrigerator or a home freezer once it has been defrosted, use a solution of baking soda in warm water (three tablespoons of baking soda to one quart of water). If food has congealed anywhere, rub with a little baking soda on a damp cloth, then rinse with clean hot water and dry with a towel.

Eggs, if they are fresh when placed in the refrigerator, should keep for about three to four weeks. They should be stored point down but should not be kept below 32 degrees F. If the whites and yolks have been separated, they can be kept up to two days, but must be covered.

Butter, either in its original wrapping or covered, will keep for about two weeks. Taking it out of the refrigerator for a short period before use improves the flavour.

Bacon should always be kept in greaseproof paper or a plastic bag or box and should be kept away from the freezing compartment.

Milk and cream or custard fillings can be kept for two days. Cooked dishes should be cooled as quickly as possible and placed in the refrigerator as soon as they are cool enough.

Cheese needs to be well covered. Cream and cottage cheese will keep for only a week.

Fruit such as plums, greengages, peaches, and nectarines, should be cleaned lightly and wrapped. Bananas are better not kept in a refrigerator.

Salad greens can be trimmed, washed, and lightly wrapped in a suitable container such as a plastic bag which should be left slightly open for ventilation. If they have to be washed, drain thoroughly before putting them in the refrigerator.

Poultry should be cleaned, and wrapped or put in a special container.

Raw meat should be put in the refrigerator as soon as possible. It should be in a container or covered with plastic but should not be sealed, as bacteria multiply in moist conditions. It is better, therefore, to risk a certain amount of drying out of the surface through too much ventilation than to risk a slimy surface by wrapping too tightly.

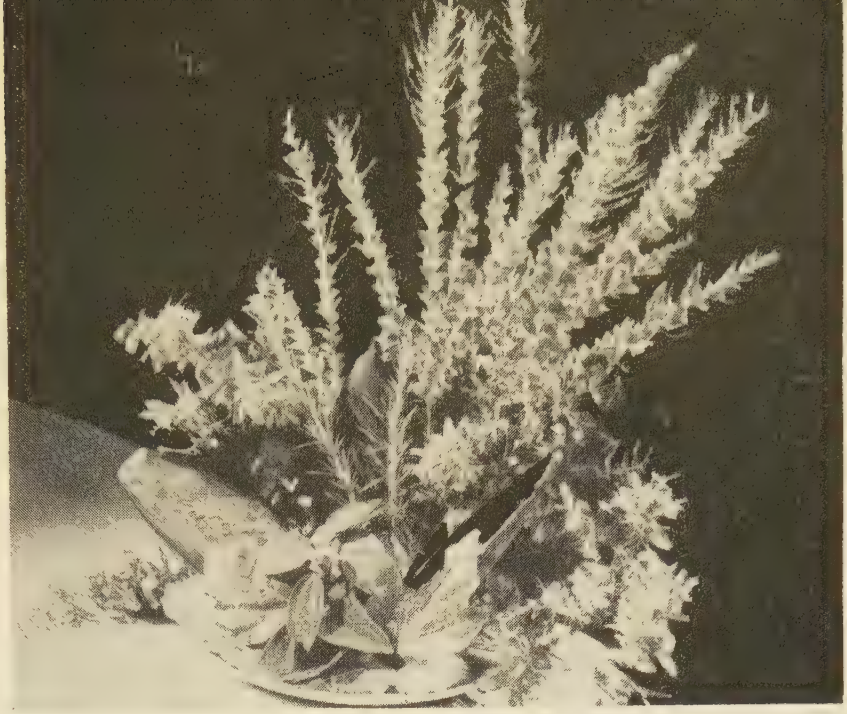
Cold cooked meat should be tightly wrapped.

Pies or gravies made with meat stocks must be cooled and refrigerated quickly and tightly wrapped or covered. They will keep for two to three days.

—PATRICIA M. de LAUTOUR,
Home Science Instructor,
Department of Agriculture,
Palmerston North

IN the height of summer flowers wilt and die quickly and in the depths of winter they are scarce, making it difficult to provide floral decorations at these times, but with a little ingenuity attractive arrangements can be made with a few flowers, foliage, house plants, or dried material.

THIS lack of flowers may supply the incentive needed to try a line arrangement in modern style. Many of the most interesting classes in floral art displays are those which require only three, five, or seven flowers. Bare or flowering branches can be used to emphasise the line of these arrangements, but they must be carefully chosen and surplus twigs cut away so that the shape is clearly defined.



Decorations when Flowers are Scarce

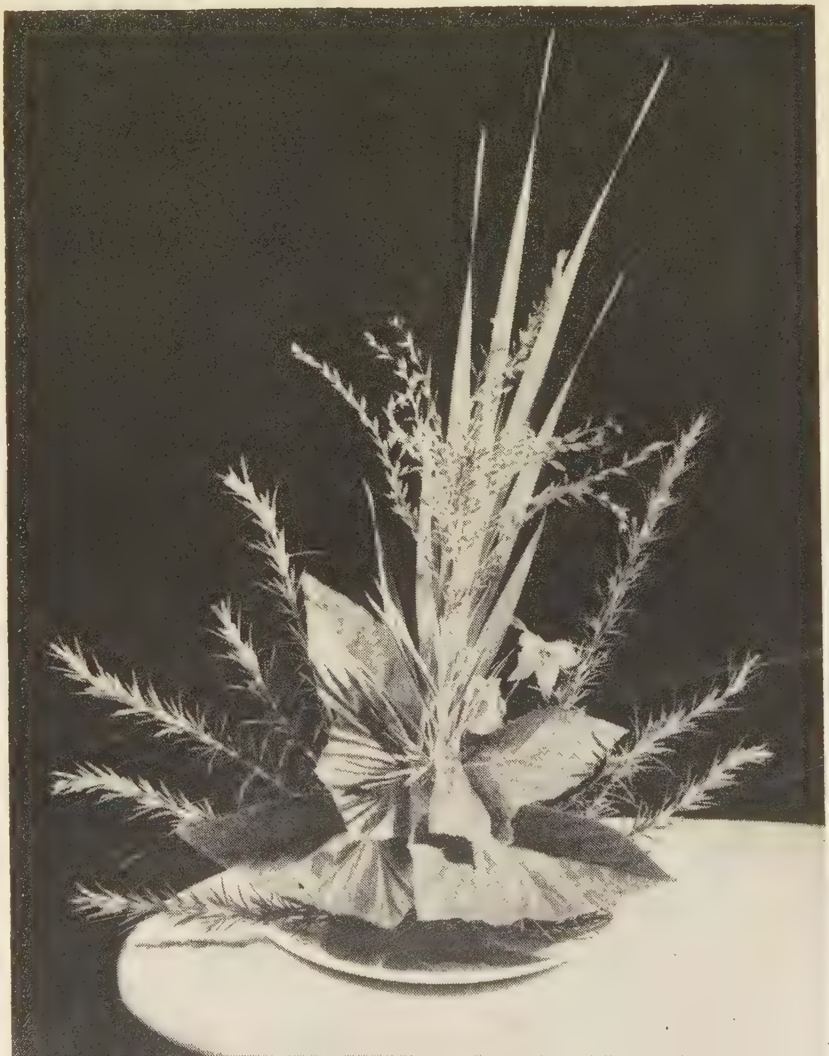
By JOY WATKINS,
Horticultural Advisory Officer,
Department of Agriculture,
Auckland

Foliage can be used to great effect when flowers are scarce and a bold display is required for a hall or large room. If the foliage is carefully chosen, it will blend with the flower colours; for example, autumn-tinted leaves with golden and bronze chrysanthemums or sprays of silver-leaved plants with white flowers.

Contrasting colours of foliage and flowers may be used, particularly when the flowers match the container or background, but when only a few flowers are available their lack of number is often emphasised by the use of complementary colouring in the foliage; red flowers with green leaves, for example.

An alternative, most effective when cleverly done but rather more difficult,

PHOTOGRAPHS: Upper—Branches of wattle *(Acacia cultriformis* and *A. baileyana)* and rosemary, rex begonia leaves, the red bracts from a banana flower, and a centre piece of lassiandra make a colourful and interesting arrangement without the use of flowers. A cluster of flowers or bright berries could replace the lassiandra at the focal point. Lower—A very simple but effective arrangement of foliage of rosemary, gladiolus, carnation, and begonia, with a sweet-corn tassel and a winter rose.



YOUR HOGGETS, FRED, HAVE BEEN HAVING A LIVELY TIME...

FRED MACKENZIE *is a fictitious character. In these advertisements, he stands for* all *New Zealand farmers, whether they be concerned with meat or wool or fruit or dairy produce. The story of his hoggets is the story of all New Zealand produce which is shipped to markets overseas.*

Twenty-five days out from Napier. Course: 058 true. Speed: 15.6 knots.

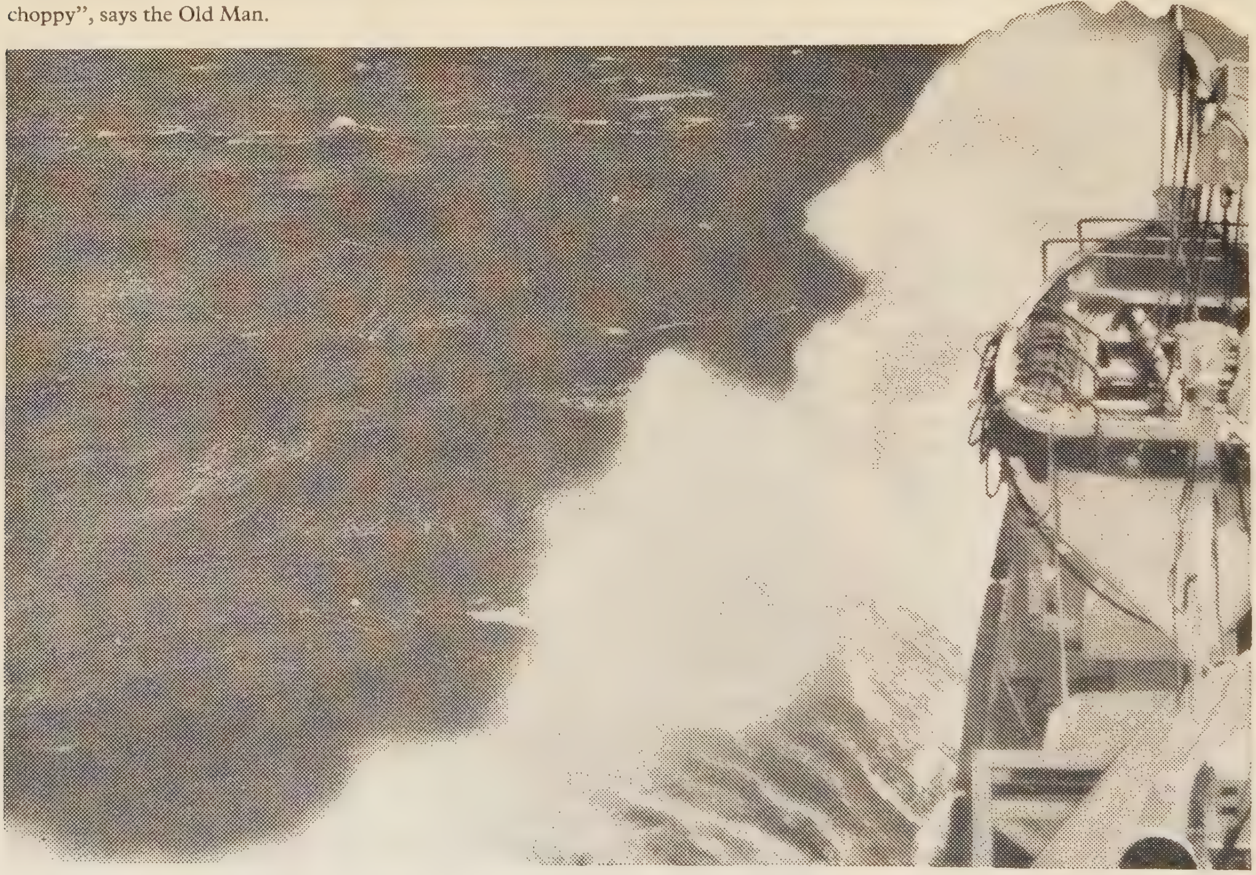
The Pacific is a long way behind us, Fred, and so is Curacao in the Dutch West Indies, where we stopped to fuel. But the memory of a six-hour shore leave is still so strong in the mind of young Tim Elliott, the Third Officer, that he's lying on his bunk right now, pencil in hand, trying to re-live the colour and the glory of the Caribbean for the benefit of the folks at home.

He hasn't made much progress. In the first place, it isn't easy — when you're in mid-Atlantic — to believe the Caribbean ever existed. And in the second place, it's pretty difficult sometimes — when you're in mid-Atlantic — to stay in your bunk *and* write a letter. Yesterday was one of those times.

Up till then, Fred, we'd had a pretty good trip—clear skies and light winds all the way. They're with us again now. But yesterday we ran into some weather—dirty grey skies full of scudding cloud and waves breaking right over the bows. "A bit choppy", says the Old Man.

Well, that's one way to put it. All the same, a bit of a dusting like that makes you realise how important ship construction and design is—and makes you thankful you've got the best. You're grateful, too, for the 13,000 b.h.p. those whacking great diesels generate below.

But you can't please everybody all the time. In the pantry the cook is still sulking: 27 cups and saucers busted in two hours yesterday. And down below at the control panel one of Harry Briggs' team still slightly battered, is checking the temperature gauges. But your hoggets, Fred, are fine. They rolled a bit and pitched a bit, but it didn't make any difference. They just went on, riding comfortably at the right temperature. Cool customers, your hoggets, Fred!



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SHAW SAVILL & ALBION CO. LTD · THE NEW ZEALAND SHIPPING CO. LTD · PORT LINE LIMITED · BLUE STAR LINE LIMITED is to use foliage of different colours and textures without flowers.

As interest grows in floral arrangements, it becomes apparent that a greater variety of foliage plants would increase the scope of the arranger. Such plants in a garden can enhance its beauty throughout the year, and many of them are suitable for difficult positions such as hot, dry banks or shady corners.

Use of Pot Plants

Decorative arrangements can also be made with house plants and other potted plants, and these are invaluable during periods of shortage of flowers. Any large, deep container can be used, though a lining of tin or plastic sheeting will be necessary if it is not waterproof. Troughs, old copper preserving pans, china bowls, and soup tureens and various types of baskets are suitable and attractive, while less decorative containers such as tins may be improved with a colour wash on the outside.

Foliage and flowering plants can be grouped to give a variety of arrangements and colour schemes. Modern house plants are mostly of interest for their foliage and if flowering pot plants are not available, suitable flowering plants or clumps of bulbs can be lifted from the garden and potted.

If a small glasshouse is available, such plants as cyclamen, primula, azalea, begonia, *Impatiens holsti*, geranium, hydrangea, and bulbs can be grown and brought into the house as required. They look particularly well with maidenhair fern, prayer plant (maranta), rex begonias, tradescantia, selaginella, and similar spreading foliage plants.

If they are to remain in position for some time, they must be well spaced and either stood on damp chippings or scoria or sunk to the rims of the pots in damp scoria or sawdust. Grouped in this way pot plants often grow better than when placed singly. This is because the mass of leaves produces a still, moist atmosphere round the plants which reduces the rate of evaporation of water from the leaves (in transpiration) in the warm, dry atmosphere of a room. In this way the leaves grow vigorously and are less likely to become brown and shrivelled at the tips and edges and less watering is necessary.

For a temporary arrangement pot plants can be crowded together to give a maximum decorative effect, and some of them can be placed at an angle or even on their sides between the others to hide the larger pots. They must not remain long in such a position, as they will become drawn and mis-shapen as they grow toward the light.

Lovely spring arrangements which will last for a week or more can be made by lifting small flowering plants and bulbs such as primroses, muscari, and miniature daffodils from the garden, and embedding the ball of soil containing the roots in tightly packed moss in a plastic-lined basket or a bowl. A few twigs of willow or other branches can be pushed into the moss to add height and to enhance the effect of spring.

House plants look much more effective when grouped to get the maximum contrast of leaf shape and colour. Any large shallow container such as a tray, basket, or bowl lined with waterproof plastic or metal is suitable.

Dried Material

A supply of dried material is useful for decoration at difficult times of the year. It is equally useful in a variety of flower arrangements, either alone or mixed with fresh material. When dried thoroughly it can be stored indefinitely in a cool, dry cupboard or box and brought out as required for individual designs. There is no need to have the same dried arrangement collecting dust for the whole winter.

The various types of "everlasting" flowers are easily grown in most gardens, though they prefer a moist, rich soil. Some which are commonly grown are helichrysum, acroclinium, xeranthemum, and statice. Many other flowers will dry and it is worth while experimenting with anything from the garden.

Results with some flowers vary from one year to the next for no apparent reason; others are most reliable. Examples of the latter are achillea, golden rod, astilbe, delphinium, larkspur, incense plant (*Humea elegans*), globe thistle, sea holly, *Artemisia lactiflora*, *Salvia farinacea*, celosia, honesty, gilia, stock, zinnia, Queen Anne's lace (wild carrot), red clover, and strelitzia.

All the above should be cut at the same stage at which they should be cut for fresh decoration. Leaves should be stripped off, particularly if they are large and wilt easily, as do those of celosia. If the flowers have weak stems and droop soon after cutting, they should be placed in water first to stiffen them, though a few are useful in decorations if they are allowed to wilt and curve over and dry in this position.

With most flowers the drying process consists of tying the flowers in small bunches of about a dozen stems and hanging them upside down in a dark room or shed where there is a dry atmosphere or a good current of air.

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ICI

Darkness is essential if the flower colours are to be preserved. Drying normally takes about 10 days, after which the material can be stored rolled in newspaper or in a box. Protection from moths, mice, and silver fish is sometimes necessary.

Such plant parts as seed pods are attractive in shape and colour and can be allowed to dry on the plant, though a wider range of colours can be achieved by picking some at an earlier, green stage and drying them upright in a basket or box. The following are usually easily obtained: gum, flax, raupo, poppy, lilies, iris, peony, albizzia, ailanthus, clematis, lupins, teasel, pine cones, gourds, and grasses of all kinds, including quaking (shivery) grass, hare's tail, Job's tears (*Coix lachryma*), pampas grass plumes, and corn tassels.

Berries and similar fruits are not so easy to dry, though some of them can be made to last for a few weeks before they begin to shrivel. Those of roses, calicarpa, winter cherry, idesia, holly, and strawberry tree are useful in this respect, others being too succulent. As soon as branches of these berries are cut any leaves should be carefully cut off, as these will draw water from the berries and hasten their drying and shrivelling. The berries will also show up better without the leaves.

Branches of winter- or spring-flowering trees and shrubs arranged in a well anchored pinholder in a shallow dish. The focal point is emphasised with clusters of blossoming twigs and bold evergreen leaves.

Autumn Leaves

The autumn colours of leaves of beech and many other trees and shrubs are one of the delights of the colder parts of New Zealand. They can be captured for winter by cutting when at the height of their colouring and pressing between thick layers of newspaper under a carpet or weighted boards. When this is being done any overlapping leaves should be removed and the sprays of leaves laid perfectly flat. Green or coloured fern fronds and punga can be treated in the same way.

In the warmer parts of New Zealand the persimmon and some poplars are the only readily available trees which have good autumn colouring. In the Auckland Province liquidamber, *Rhus cotinoides, R. typhina*, cherry, Virginia creeper, and viburnum are usually reliable in this way, while in those parts of New Zealand which have harder winters there is a wide choice: beech, acer, azalea, cornus, and parrotia, to name only a few.

The mature leaves of many plants dry well if treated in the manner recommended for drying flowers. Those of calla, strelitzia, and red-leaved sumach, hosta, and many house plants all dry satisfactorily.

Leaves or branches of magnolia, dogwood, beech, and broom as well as those mentioned above can also be preserved with the use of glycerine. A solution of one part of glycerine to two parts of water is readily absorbed by most leaves in the same way as they absorb clear water. The ends of the stems should be left in this solution for two or three weeks or until the leaves have turned the desired colour. They will become darker as more glycerine is taken up.

It is important to use perfect young growing leaves or branches, as this treatment is not effective for leaves which have already turned colour and are about to drop or die back. When not in use preserved leaves can be rolled loosely in newspaper and stored in a box or cupboard.

If desired, both dried and fresh material can be painted or dyed, and various paints are available. The colour of fresh white or pastel flowers can be changed by standing the stems in a dye made up of a ¾ or 1 oz bottle of coloured ink added to 1 pint of rainwater, with 4 teaspoons of powdered alum added to fix the colour. Fresh flowers will absorb the colour with the water. Alternatively the heads, leaves, or seed pods can be dipped in the dye.

In early spring it is often a problem to decorate large rooms and halls for functions requiring a set colour scheme, but if wild arum lilies are plentiful, they can be used most effectively when dyed or painted with a water paint. Painting on the inside only may be sufficient.

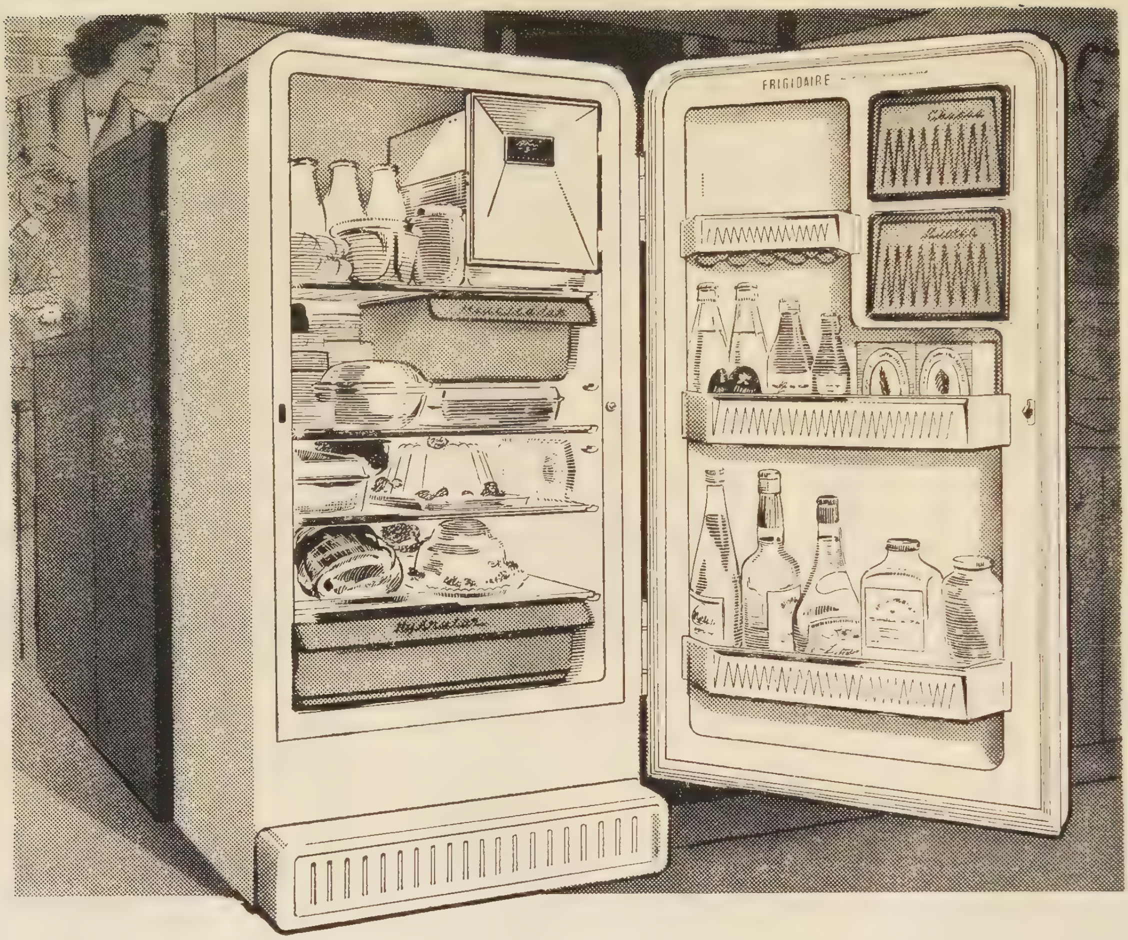
Finally there are the shrubs and trees which come into flower and leaf early in spring. Some of these can be made to flower earlier by cutting branches any time after June and placing them in water in a warm room. Forsythia comes into bloom quickly if the branches are first dipped for 10 seconds only in warm water (104 degrees F).

Charming arrangements can also be made with bare branches, which will gradually develop their leaves in the warmth of a room. Results will again be improved by bruising or slitting the bases of these woody stems before placing them in water.

Garden Work for May

Plants to Note

The ornamental manukas are beginning to flower, some of the newer varieties being particularly colourful, with large single or double flowers in shades of white, pink, and red. Red Damask, Martini, Keatleyi, Twinkle, and Scarlet Carni-



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Shrubs and trees with richly coloured berries show up now. *Euonymus europaeus*, the spindleberry, has a brilliant combination of orange and pink. *Cotoneaster harrovianus* has long arching sprays of bright red berries and does well in most parts of New Zealand. It seems to be less susceptible than *C. serotinus* to fireblight. Cotoneaster bushes which are severely affected with this disease should be removed and burnt to prevent the spread of infection to apples and pears. Those with only a few branches on which the leaves have turned brown should have these branches removed, cutting well back into healthy wood.

Hebes or koromiko are native evergreen plants which are rarely out of bloom. They are particularly useful in sections exposed to salt winds, the taller kinds making good hedges near the sea. Some of the modern dwarf varieties are most suitable for the front of a shrub border. They bear rich purple or deep blue spikes of flowers at the tips of the branches. Good varieties are Autumn Glory, Violet Meikle, and other varieties of *H. speciosa*.

Gardens in milder parts have their first breath of spring with the opening of Soleil d'Or narcissus. This is still one of the finest early flowering bulbs and the colour and scent are unrivalled. Other bulbs are emerging and where these are grown in groups in the shrub border, or in rows for cutting, they can be covered with a mulch of untreated sawdust, through which they will grow. This mulch will help to keep the blooms free of mud splashes and will allow one to walk among them when picking the flowers without consolidating the wet soil.

Dahlias should be cut back now, and unless they are growing in well drained soil in very sheltered or warm positions, it is advisable to lift and store them in a dry, frost-free shed for winter. After they are shaken free of soil they should be dusted with thiram or a similar fungicide to protect them from storage rots. Thick layers of newspapers laid over the tubers will keep out several degrees of frost. Slaters can be troublesome, but can be checked by dusting the tubers with 5 per cent DDT.

At this time of the year planning is started for next season. Catalogues arrive, and this is when the notes made at shows or when visiting other gardens are useful. Before ordering new plants, it is as well to make sure that they will enhance the garden by fitting in well with the general plan.

Before new shrubs or roses are planted, the ground should be thoroughly prepared, drainage being improved where necessary and perennial weeds removed. If a shrub or tree has died, particularly from collar or root rots, the ground should be treated with copper oxychloride at 1 lb to 5 sq. yd. before replanting. It is always preferable to plant in fresh ground if this is available. A larger area than that required immediately for the roots of the new plant should be prepared and enriched if necessary with compost or leaf mould and with bonedust or superphosphate.

A mixed flower border where contrasting colours and textures of the shrubs and perennials have been used most effectively.

Herbaceous Borders

Herbaceous borders can be a source of colour and of cut flowers for the greater part of the year, but for ease of upkeep the preparation or renovation of the border must be thorough to eliminate weeds which get into clumps of michaelmas daisies and other plants.

Borders which have become overgrown with weeds and with the more rampant or less attractive herbaceous plants should be renovated. The procedure is first to label all healthy plants of good varieties which are worth keeping and to lift these and heel them in in the vegetable garden or any spare ground.

Some plants such as peonies and oriental poppies should not be moved, as they are likely to stop flowering for several years if disturbed. The border should then be deeply dug, all weeds being removed and well decayed manure, compost, or leaf mould being incorporated into the top spit of soil. Before replanting in early spring, a balanced fertiliser dressing at 4 oz to the square yard should be worked into the topsoil. Proprietary mixtures are available, or one can be made up from:

3 parts of superphosphate
2 parts of sulphate of ammonia
1 part of sulphate of potash

Aldrin 40 per cent wettable powder at 1 oz to 38 sq. yd. can be added to the fertiliser mixture to eradicate soil pests. Some thought should be given to the arrangement of plants in the border so that the maximum effect is obtained with blending and contrasting colours and textures of flowers and foliage throughout the season.

Obviously the shorter plants should be toward the front of the border, and the taller ones at the back. Groups of each variety are usually more effective than single plants. Bulbs can be placed where their dying foliage will be hidden by the growth of later flowering plants. Small, dainty shrubs can be used to give shape and interest to the border during winter.

Foliage plants are valuable both in the garden and for cutting. The shape, texture, and colour of leaves as well

Dividing a clump of kniphofia.

as the overall shape of the plant play their part in the use of foliage plants. The sword-like leaves of flax and the feathery foliage of santolina provide as great a contrast as the differences in colour. Bronze-leaved plants look well with flame-coloured flowers—yellow, red, orange, and apricot. Grey-leaved plants are effective with either pastel or intense colours and are useful where two clashing colours, pale pink and deep orange, for example, need to be separated. Plants with gold or silver variegations are lovely with shades of blue, cream, and white flowers. The inclusion of these foliage plants can thus add distinction and interest to a border throughout the season.

If the soil is light and well drained, particularly in the warmer parts of the country, planting can take place as soon as the soil has settled again after digging. On clay soils or where winters are hard it is better not to plant until early September. Before planting a few plants such as carnations and pinks, lavender, scabious, and lupins will benefit from an application of agricultural lime to the soil at about 8 oz to the square yard or according to the acidity of the soil.

If planting is to take place now, those plants which were heeled in can be divided up, using two forks back to back to split the clumps. Small portions only should be replanted; each with a good root system and one to three shoots or buds. The distance of planting will vary with the ultimate size of the plant.

Close planting provides a good display in the first season, but necessitates lifting and dividing more frequently — every year with such plants as michaelmas daisies and chrysanthemums. When a border is being replanted spaces can be left for plants which are ordered now from the nurseries for delivery in spring.

If culling of diseased or inferior plants from the old border has been drastic, it may not be possible to fill the border completely with desirable herbaceous plants during the first season, but the spaces can be filled with annuals or bedding plants.

When any replanning of the garden is contemplated advantage should be taken of any showings of coloured slides, which can give one a very good idea of the characteristics of individual plants and the layout of attractive gardens, and often illustrate faults in planning and planting.

Glasshouse and House Plants

Water carefully and much less frequently, being particularly careful not to get water into the centre of such plants as African violets and cyclamen. The water should be at room temperature. Winter-flowering pot plants should be fed regularly with a proprietary liquid fertiliser or with 1 teaspoon to the gallon of dried blood or blood and bone.

Ventilate the glasshouse during the middle of the day whenever conditions are mild, but close down early to conserve the sun heat. Artificial heat should be started before sunset on cold days to avoid a sudden drop in temperature at this time. House plants should be kept well away from windows at night for the same reason. They should have an even warmth during day and night and be out of draughts.

Some time during winter it is advisable to prepare a stack of turfy loam for use in potting composts next spring and summer. Turves from a well grazed paddock on a light to medium loam are ideal. They should be cut to a depth of 4 in. to 6 in. so that only the fertile top soil, full of roots, is taken. The turves should be stacked one on top of the other, grass-side downward, with a sprinkling of agricultural lime between each layer if the soil is at all acid.

If the soil is rather poor, it can be enriched by substituting any available animal manure for the lime in alternate layers. Lime and manure must not be placed together, as they react and cause the nitrogen in the manure to be released in the form of amonia gas. The turves should be watered as they are stacked if they are dry.

In a small garden similar use can be made of any pieces of turf removed when trees or shrubs are to be planted in a lawn or when the edges are being re-cut.

This turf makes much better potting soil than the earth from cultivated parts of the garden, particularly where this is clay. It will be ready for use after a few months, when all the grass and roots are thoroughly rotted. Chop the heap down vertically with a spade to mix all the layers, and put through a ½ in. sieve for potting or a finer one for seed sowing. It is then ready for mixing with river sand or scoria and leaf mould or peat to form compost.

Floral Arrangements

Branches of berries can be used alone or with flowers and leaves. The sprays of berries will last longer without shrivelling if they are first stripped of leaves. Large bunches of berries and fruits are normally placed at the focal point of a mixed arrangement, where they help to give weight to the design. Too many large dark fruits give a dull and heavy effect.

Poinsettias are starting to flower now, and look well against a background of green leaves. The stem ends must be seared by holding them in a flame for 15 seconds; otherwise the sap will congeal over the stem end and prevent the uptake of water.

Flowers which have grown from bulbs last as long if not longer in a shallow bowl of water than in a tall vase. Before arranging they should be placed up to their necks in water in a cool, dark place for at least four hours and preferably overnight.

Some winter-flowering succulent plants are most effective and long lasting as cut flowers, their bronzed or glaucous foliage and warm red, orange, or yellow flowers being most welcome now. In the milder parts of the country these will flower freely out of doors, particularly on poor soils and on banks which are hot and dry during summer. In colder districts they will need some protection from frosts. *Echeveria multicaule* is one of the best, flowering over a very long period. Other echeverias, aloes, agaves, and yuccas also provide useful flowers in winter, though these can be grown only in frost-free areas.

All photos except those on page 407 and this page by Sparrow.

Are Your Jams and Jellies Always Perfect?

IF you have been successfully making jam and jelly for years, you may be surprised and disappointed when one season they are not up to their usual standard. Perhaps some jam did not set, perhaps it became mouldy, or perhaps the jelly was very cloudy. In this article Janet W. Roberts, Home Science Instructor, Department of Agriculture, Auckland, gives reasons for these faults and others which crop up from time to time.

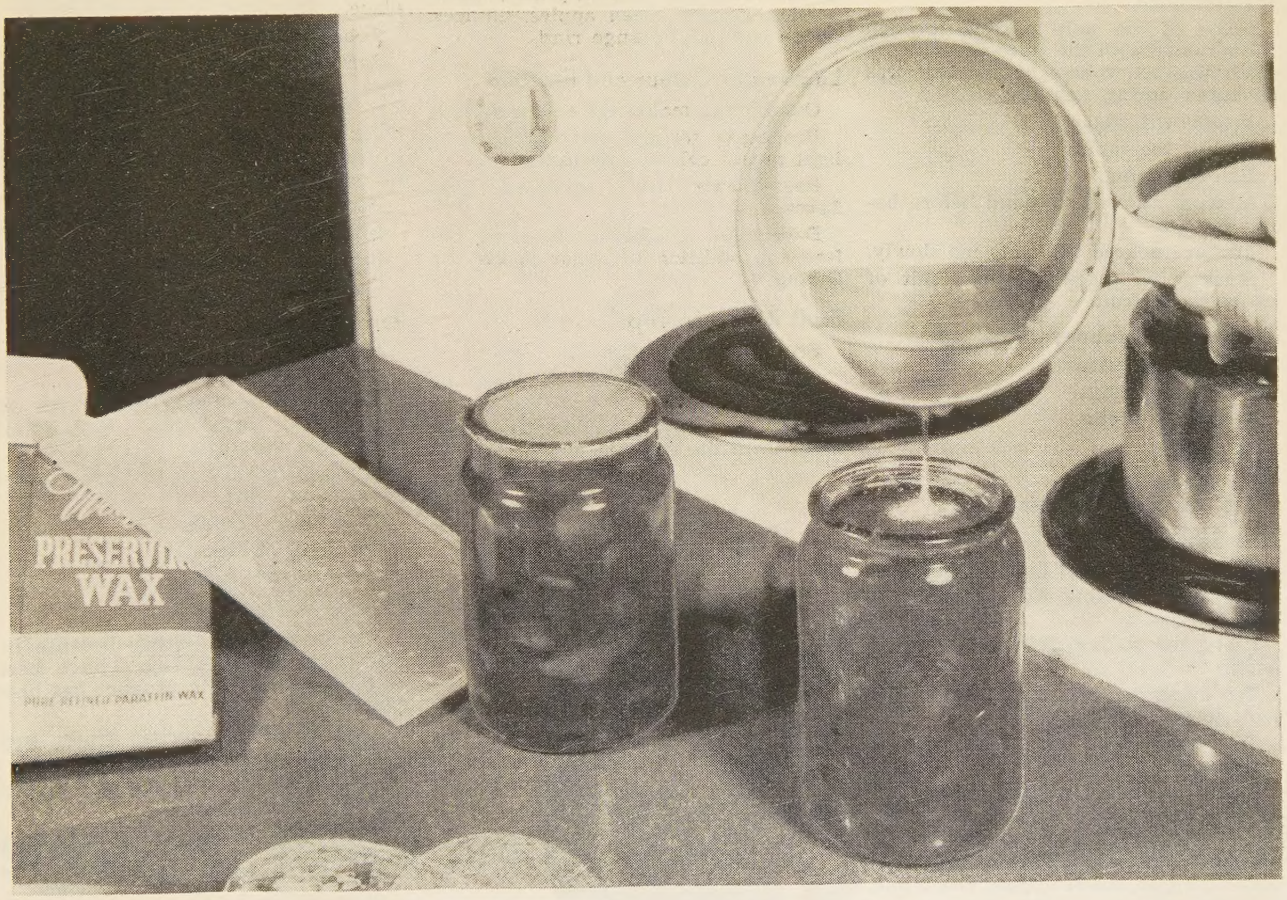
Characteristics of Perfect Jelly

Perfect jelly is clear, sparkling, a good light colour, with a fresh flavour true to the type of fruit from which the jelly is made. The jelly should be tender in texture and quivering in consistency. It should be easily cut with a spoon, yet firm enough to retain the angle of the cut. Acid, pectin, and sugar must be present in proper proportions to make a good jelly.

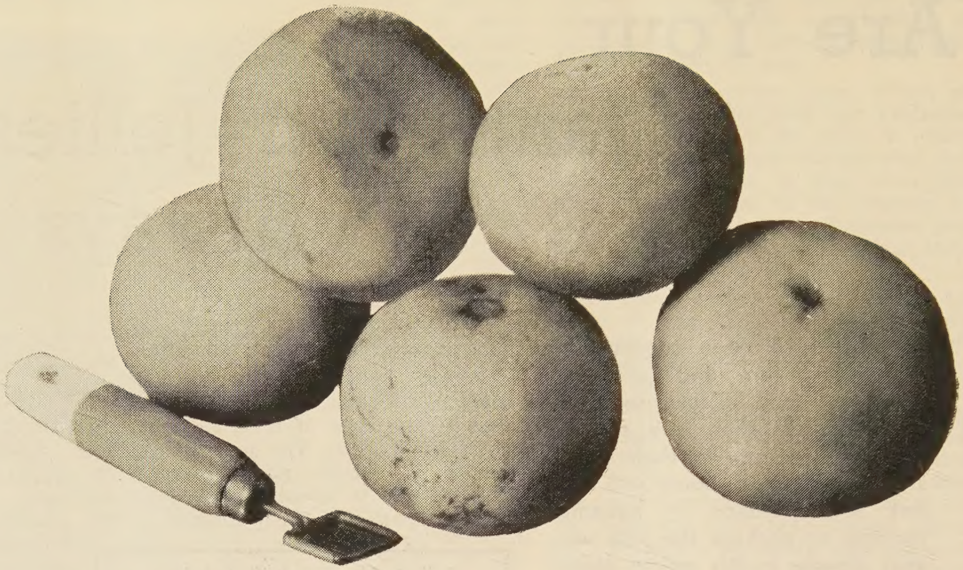
Bulletin No. 401, "What Judges of Home Produce Look For" (price 1s.), can be used as a guide for those who are asked to judge exhibits at shows. It will shortly be available from all offices of the Department.

Characteristics of Perfect Jam

Jam should have a natural colour and it should sparkle as it catches the light. It should move but not flow when the jar is tipped. The jam should not stick to the spoon and it should spread easily. The fruit should be evenly distributed and there should be no large lumps of fruit. There should be no trace of mould or crystallisation and the flavour should be fresh and true to the fruit that the jam has been made from.



Melted wax forms a complete seal.



Only good-quality fruit should be used for jam or jelly making. Fruit too ripe can cause failure to set and poor-quality fruit leads to other faults such as cloudiness, poor flavour, or mould.

CAUSES OF IMPERFECTIONS IN JAMS AND JELLIES

Cloudy Jelly

The starch from unripe fruit.

Overcooking the fruit before straining the juice.

Some of the pulp passing through the strainer with the juice because the cloth was too coarse or the bag was squeezed during straining.

Insufficient sugar.

Boiling too rapidly.

Bad skimming.

Mixture allowed to stand before being poured.

Mixture poured into jars too slowly.

Setting too quickly as a result of using green fruit.

Tough and Rubbery Jelly

Not enough sugar.

Boiling too long.

Too much pectin.

Lumpy Jelly

Overboiling.

Too quick-setting pectin.

Not Setting

Hard water affects the setting point.

Insufficient boiling after the addition of the sugar.

Prolonged boiling which destroys the pectin.

Too much sugar in proportion to the fruit juice.

Too much acid; this usually causes "weeping".

Insufficient acid and pectin either because of over-ripe fruit, or because the fruit is lacking in these substances.

Some fruits which **lack acid** are sweet oranges, sweet apples, pears, and peaches.

Some fruits which **lack pectin** are ripe peaches, strawberries, pineapple, cherries, rhubarb, pears, and ripe apricots.

Some fruits which are **good sources of acid and pectin** are cranberries, gooseberries, crab apples, plums, blackberries, grapes, green apples, quinces, lemon rind. and orange rind.

Lacking in Colour and Flavour

Overboiling makes the colour darker.

Prolonged storage and exposure to light causes colour deterioration.

Poor-quality fruit gives a poor flavour.

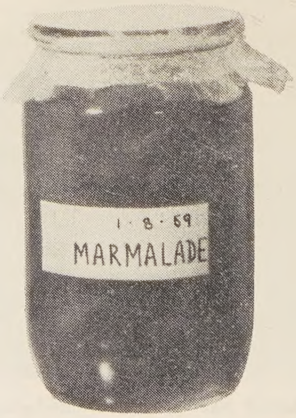
Boiling too quickly or too long before the addition of sugar spoils the flavour.

Fruit Rising to Top

Fruit not fully ripe.

Fruit not thoroughly crushed or ground.

Fruit not cooked sufficiently (fruit floats until the syrup penetrates it).



Strawberry jam, marmalade, and conserves should be allowed to cool slightly and then given a stir before they are potted.

Mould

Stored in a warm, damp, or light place.

Too little sugar.

Jars insufficiently filled. The mixture should be not less than ¼ in. to ⅛ in. from the top of the jar.

Jar not sealed while still very hot so that it may be infected with mould spores from the air.

Poor-quality fruit or dirty sugar.

Insufficient boiling.

Insufficient skimming.

Froth stirred into the mixture.

Fermentation

Too little sugar.

Not set well.

Too short a cooking time, with the result that insufficient evaporation affects the proportion of sugar.

Jam allowed to cool too much before pouring into jars.

Imperfectly sealed.

Not sealed while hot.

Jars not sterilised.

Crystallisation

Too much sugar, either because incorrect amounts of sugar have been used, or because the product has been overcooked.

Lack of acid in certain fruits, such as blackberries and cherries.

Too much boiling of the juice before the sugar was added.

Insufficient boiling after the sugar was added.

Jam not boiled quickly enough.

All photographs by Sparrow.

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